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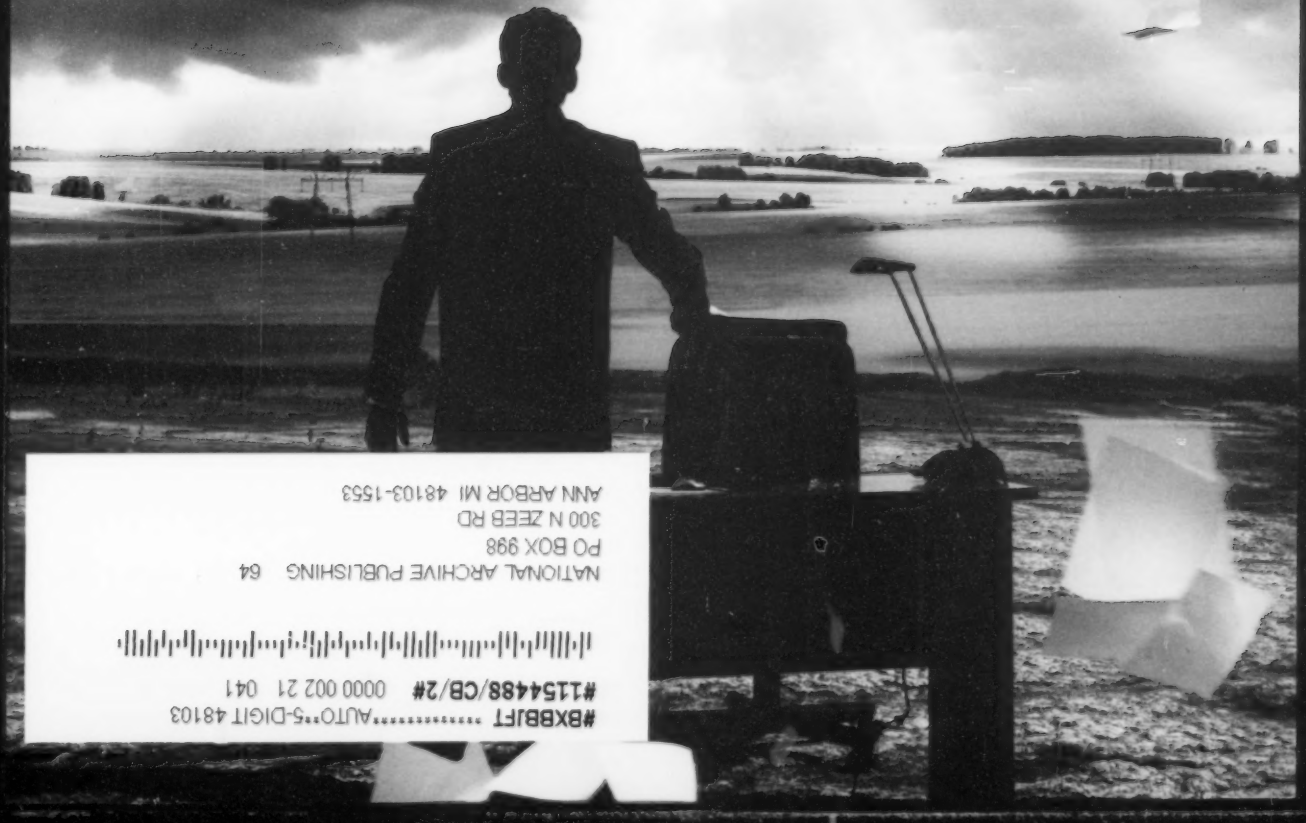

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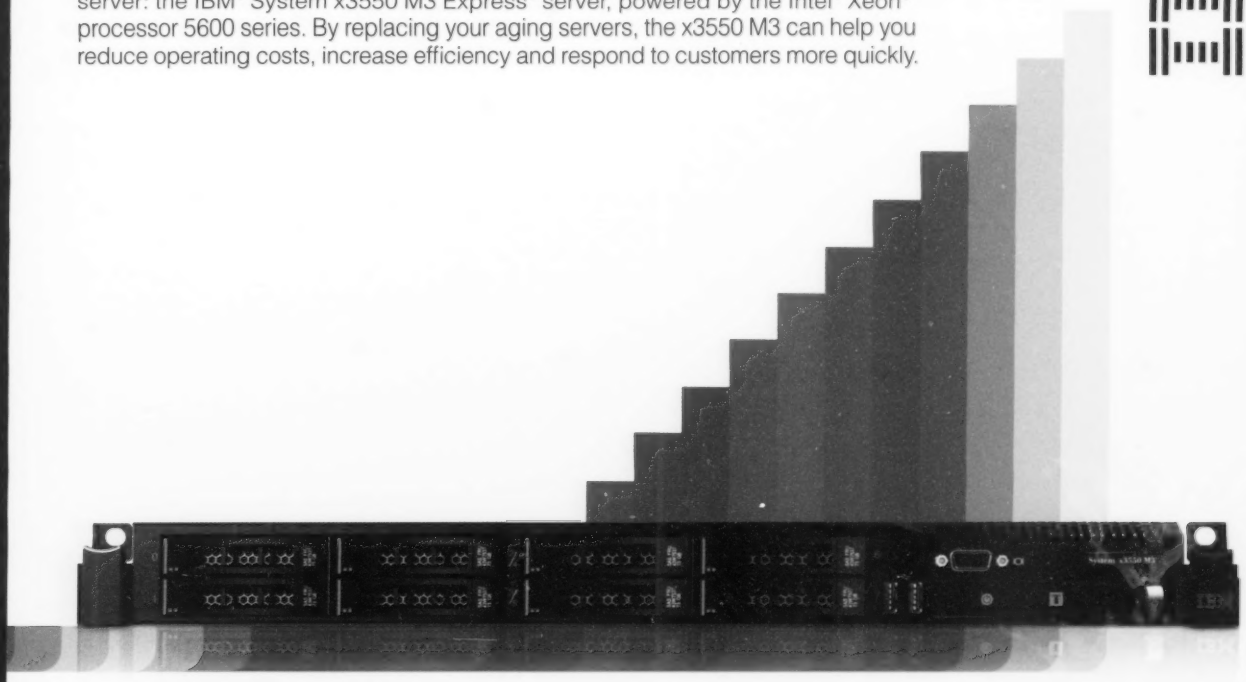

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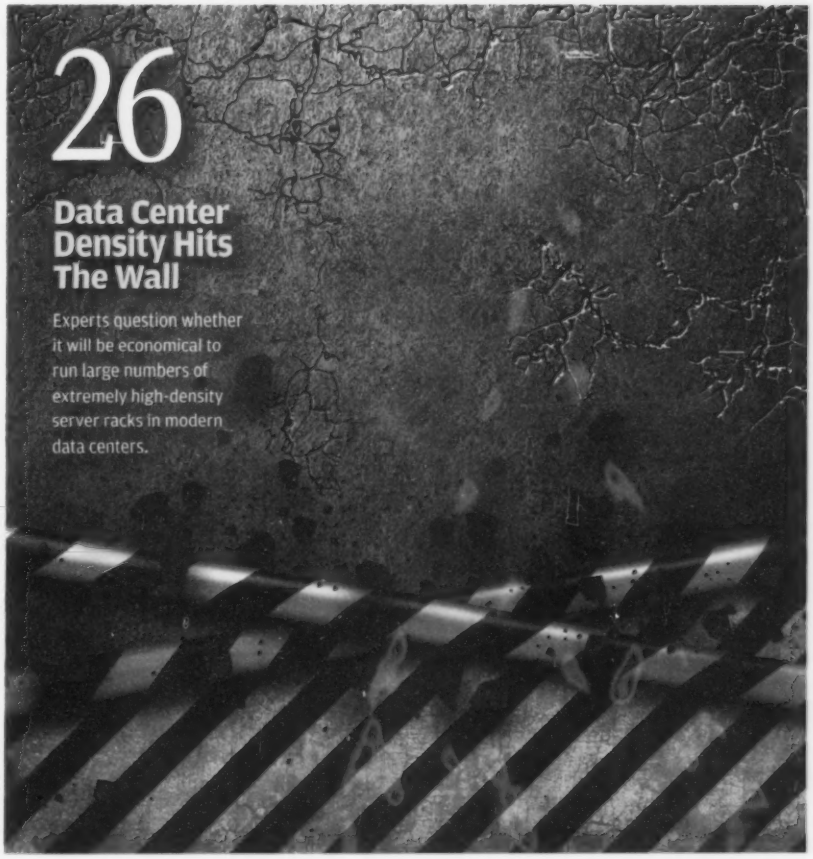

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Data Center Density Hits The Wall

Experts question whether it will be economical to run large numbers of extremely high-density server racks in modern data centers.

COVER STORY

Cloud Security: Oxymoron?

18 The pioneers of cloud computing and SaaS are using third-party tools and due diligence to manage the security risks.

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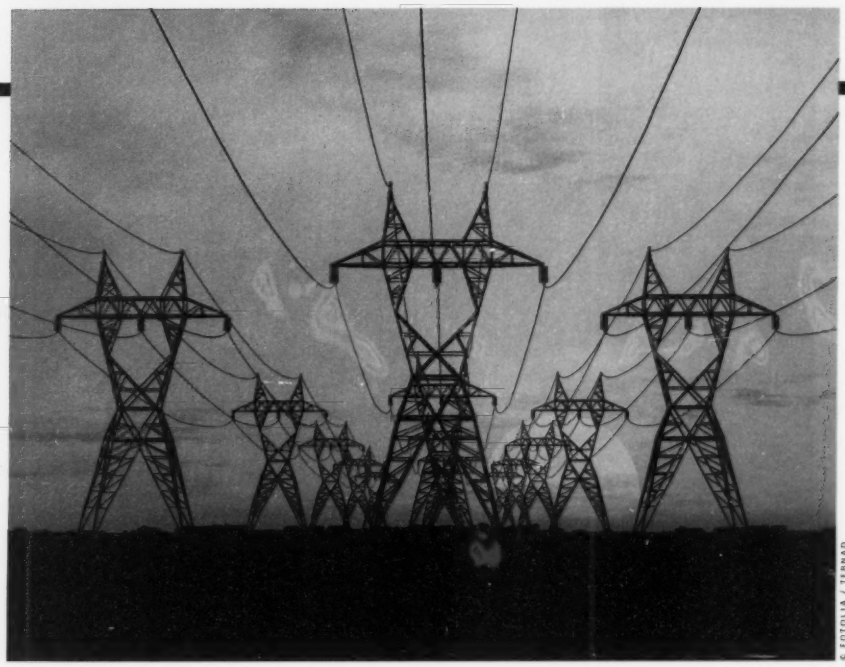

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DATA CENTERS

IT Is Greener When It Pays the Power Bill

WANT TO really cut energy use in data centers? Give the CIO responsibility for paying IT's power bills. That would create a big incentive to invest in energy efficiency, according to Dean Nelson, senior director of global data center services at eBay Inc.

"When the CIO is paying the power bill, [he] really understands the impact of the decisions being made," Nelson told an audience of data center managers at the Uptime Institute Symposium 2010 in New York last month.

Most CIOs don't see utility bills, but eBay lumps its power bills in with its IT budget, and as a result the company has been very aggressive in cutting power consumption. Nelson said that eBay's newest data center, a $287 million facility in Salt Lake City, was "paid for by the cost savings we've achieved [elsewhere] within the last two years."

In essence, eBay's IT department is "self-funding" new spending by being more efficient, he said.

Nelson said the IT department changed its metric for vetting technology investments from transactions per second to transactions per watt. That switch led to an increase in virtualization and a decision to move non-mission-critical applications out of Tier 4 data centers, which cost two to four times more to operate than standard data centers.

EBay upgrades its equipment every two years to get more-efficient models, Nelson said. And it uses Intel Nehalem processors, which offer greater performance on a per-watt basis than previous chips.

– Joab Jackson, IDG News Service

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WASHINGTON WATCH

FTC Examines Privacy Risks Of Photocopiers

The U.S. Federal Trade Commission is urging the photocopier industry to address privacy risks arising from the fact that digital copiers store thousands of documents on their internal hard drives.

CBS News reported in mid-April that nearly every copier built since 2002 stores images of documents that pass through the machines. The report found sensitive health and law-enforcement information on copiers ready to be resold.

In a recent letter to Rep. Ed Markey (D-Mass.), FTC Chairman Jon Leibowitz said the agency is examining whether copier makers and resellers are warning their customers about the privacy risks, providing educational materials and offering "options for secure copying."

Markey, who requested the FTC investigation, called the hard drives a "treasure trove" for identity thieves, who could obtain Social Security numbers, birth certificates, medical records and bank records.

Xerox Corp. offers customers the option of removing the hard drives from copiers that they are about to dispose of or turn in after a lease, a company spokesman said. The copy machine maker also offers a free image-overwrite option that destroys information stored on many models' hard drives, he said.

– GRANT GROSS, IDG NEWS SERVICE

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BETWEEN THE LINES

By John Klossner

Micro Burst

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The number of netbooks shipped worldwide is expected to reach

58 million

this year, up from 36.3 million last year.

SOURCE: ABI RESEARCH, NEW YORK, MAY 2010

RESEARCH RECAP

Perfect Storm Sinks Unix Server Sales

THE ECONOMIC RECESSION hit the Unix server market hard. IDC market-share numbers show that users put off buying Unix systems in recent months, cutting Unix's share of overall server spending to one of the lowest levels ever.

An IDC report, released last month, tallied worldwide Unix revenue of $2.3 billion — about 22% of total spending on servers — during the first quarter of this year. The Unix share of server revenue was down 10.5 percentage points from the same quarter a year earlier.

The latest numbers notwithstanding, Unix still accounts for a big portion of server revenue. Unix servers are mid- to high-end systems that typically run mission-critical applications, but they are gradually declining in popularity as x86 servers grow more powerful. Unix servers may run one of several Unix variants, including Solaris, AIX and HP-UX.

IDC analyst Jean Bozman attributed the sharp drop in first-quarter Unix server sales to a combination of factors, including these:

- The recession delayed sales of Unix servers, which are typically replaced every five to seven years.
- Although Oracle Corp.'s deal to acquire key Unix server vendor Sun Microsystems Inc. closed in January, users might be putting off purchases of Sun products until Oracle fully absorbs the company.
- Users may be waiting for Unix server upgrades from Hewlett-Packard Co., which recently announced new products in its Integrity line, and from IBM, which is expected to release new Unix servers later this year.

Analysts said it's too early to gauge whether users are accelerating a shift away from Unix.

Oracle may be "the biggest question mark, although the company has thrown its weight behind Sun's UltraSparc Unix systems," said Pund-IT Inc. analyst Charles King. "[Oracle] said that it will continue development, but it is going to take a while for us to really see what the shape of that is going to be."

– Patrick Thibodeau

E-BUSINESS

Zappos Earns No. 1 Ranking For E-retailing

Zappos.com Inc., the online shoes and clothing retailer, scored top marks in a study of customer service at online shopping sites, according to ratings agency StellaService LLC in New York.

The firm rated the 150 largest Internet retailers on 300 factors, such as online tools and their Web sites' user interfaces. Following Zappos in the rankings were Diapers.com, BlueNile.com, Amazon.com, Staples.com, Crutchfield.com, LLBean.com, BestBuy.com, Apple.com, Sears.com and REI.com.

The evaluations included usability tests, orders (and returns) of several products, and more than a dozen interactions with customer service representatives via phone, e-mail and live chat.

StellaService also commissioned a survey of 304 consumers and found that Americans, on average, are willing to pay a 10% premium for great customer service. Respondents said that speed of delivery is the biggest factor in online shopping, followed by helpful staffers and easy access to information on a company's Web site.

– MITCH BETTS

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> **Our IT employees had a lot of questions.** They flat-out asked, 'What does this mean for me and my job?'
>
> **DOUG PIERCE,** GLOBAL IT DIRECTOR, MOMENTUM WORLDWIDE

NEWS ANALYSIS

IT Staff Must Buy Into Cloud Moves

In addition to dealing with user resistance, CIOs need to gain the support of IT staffers to successfully switch from in-house to cloud-based apps. By Juan Carlos Perez

INFORMATION TECHNOLOGY EXECUTIVES overseeing a corporate switch to cloud-based applications are generally ready on Day One to deal with security and compliance issues along with resistance from end users.

However, CIOs and IT managers also need to be prepared for another roadblock that could hinder or even doom a company's cloud computing plans: pushback from IT staffers.

When top executives decide to unplug on-premises servers, ditch the applications housed on them and adopt vendor-hosted software, the IT personnel that support and maintain those systems are bound to get nervous.

Doug Pierce, global IT director at Momentum Worldwide, a New York-based advertising and events marketing firm, said many of the company's 28 IT staffers raised concerns about job security as soon as they learned of plans to let cloud vendor Socialtext Inc. host Momentum's enterprise portal.

"Our IT employees had a lot of questions," Pierce said. "They flat-out asked, 'What does this mean for me and my job?' "

From the beginning, the company kept employees informed of the consequences of the move — in this case, role changes for eight members of the staff, he said. "Keeping [the process] very open and making sure IT employees understood was very helpful to our department's successful transition," Pierce added.

The IT leaders at San Jose-based electronics manufacturer Sanmina-SCI Corp. also say openness with employees was helpful in moving from an on-premises Microsoft Outlook/Exchange system to hosted Google Apps offerings.

"IT is becoming more of a service-oriented organization, providing more value-added services, with less emphasis on [maintaining in-house] systems, networks and architectures," said Sanmina-SCI CIO Manesh Patel.

Cost was an important factor for Sanmina-SCI, and it's what initially drove the move to the cloud, but Patel said the company sought longer-term value by making its 700 IT workers more productive and effective. "Make sure you communicate those things and provide the vision of what that means," he added.

At some companies, like Duralee Fabrics LLC in Bay Shore, N.Y., there was little pushback from IT personnel. CIO Bill Kelly noted that the six-person staff was "thrilled" that an overtaxed on-premises e-mail system was replaced with Google Apps. ◆

Perez *is a reporter for the IDG News Service.*

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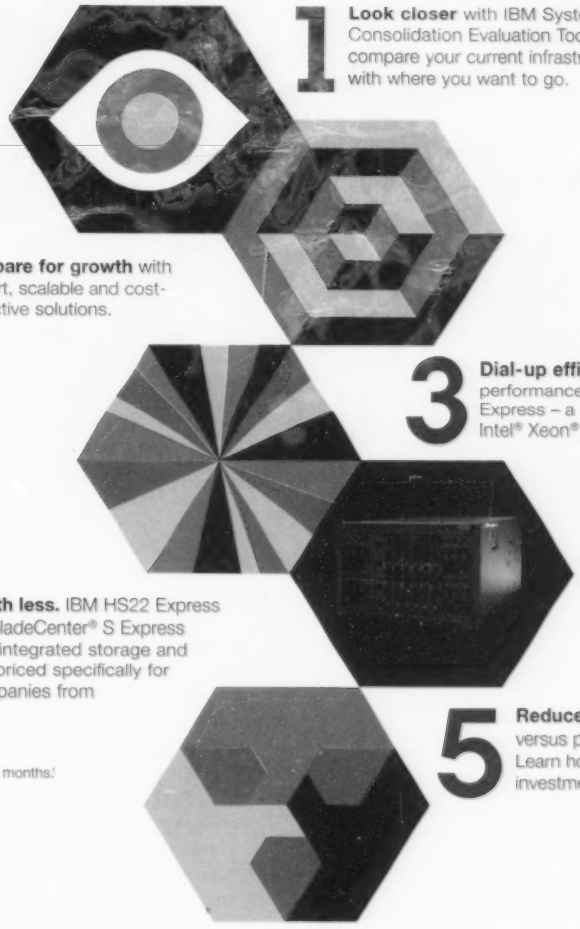

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NEWS ANALYSIS

HP Seeks New Skills To Staff Data Centers

Hewlett-Packard is cutting 9,000 IT jobs while adding 6,000 new employees who have sales and service-delivery expertise. By Patrick Thibodeau

THE REALIGNMENT PLAN that Hewlett-Packard Co. announced last week — which calls for cutting 9,000 IT positions while adding 6,000 new employees — is the latest example of the changing staffing needs brought on by a shift to highly automated data centers that no longer require workers with hands-on IT skills.

Many companies are looking to staff next-generation data centers with people who have expertise in the sale and delivery of IT services.

HP has not yet specified which positions are slated for elimination, but James Staten, an analyst at Forrester Research Inc., speculated that they will most likely be IT operations posts like systems administrators. Most of the 6,000 new hires will probably be IT architecture and sales experts, he added.

The company said the changes in its Enterprise Services unit will take place over several years.

In a conference call with investors, HP executives called the realignment the latest step in the evolution of its services operation — a key part of the company since its 2008 Electronic Data Systems Corp. acquisition, which brought 137,000 new employees on board.

HP said the restructuring will also include the consolidation of data centers and management platforms that will eventually allow for a more automated delivery of services to customers. "We think the next five to 10 years are going to be about who can best use technology to automate the delivery of services," said Ann Livermore, executive vice president of HP's Enterprise Business unit.

The plan renews an effort launched prior to the EDS deal, when HP cut its corporate data centers from some 85 to six, added industry-standard products and got rid of redundant or outdated hardware and software.

HP has gained a raft of new data centers since the EDS deal; most were acquired from customers as part of outsourcing agreements.

Martin Reynolds, an analyst at Gartner Inc., said that the services unit improved the efficiency of the acquired data centers, but "they are [still] not as streamlined as HP wanted them to be."

Reynolds expects that HP will move to further streamline those operations by turning to x86 applications for consolidation and virtualization rather than mainframe and Unix systems. "They are looking to take all those nonvirtualized x86 applications and move them to HP's managed environment," he said.

The moves may indicate that HP has convinced its customers that its data center plans will ultimately reduce their IT costs. ◆

Peter Sayer *and* **Chris Kanaracus** *of the IDG News Service contributed to this story.*

We think the next five to 10 years are going to be about who can best use technology to automate the delivery of services. — ANN LIVERMORE, EXECUTIVE VP, HEWLETT-PACKARD CO.

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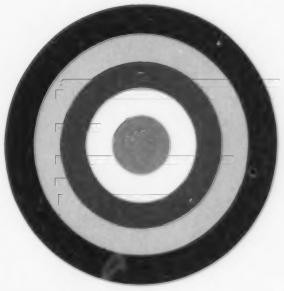

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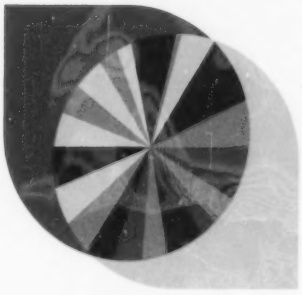

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THE Grill

Fred Brooks

The **father of the IBM System/360** reveals his secret for great design.

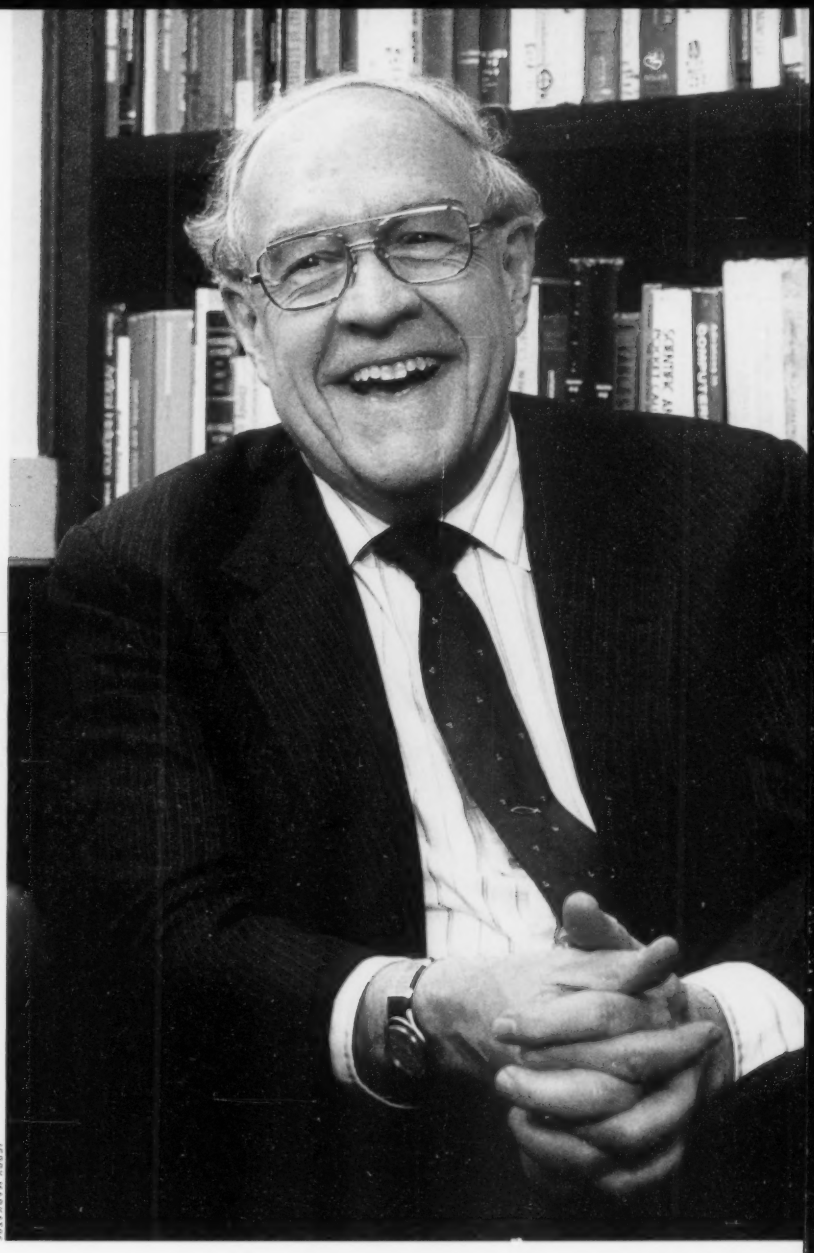
In high school, you were: One of two students they thought of as academic! (Five of my high school's class of 90 students went on to become university professors.)

Favorite technology: The Macintosh laptop

Four people you'd like to invite to a dinner party: C.S. Lewis, Gerrit Blaauw (my best friend in the world), my wife and John Fairclough (my best friend before he passed on).

Favorite design: My beach house is my all-time favorite, but I'm very fond of my Chevrolet Avalanche truck!

Favorite work of fiction: J.R.R. Tolkien's *The Lord of the Rings*

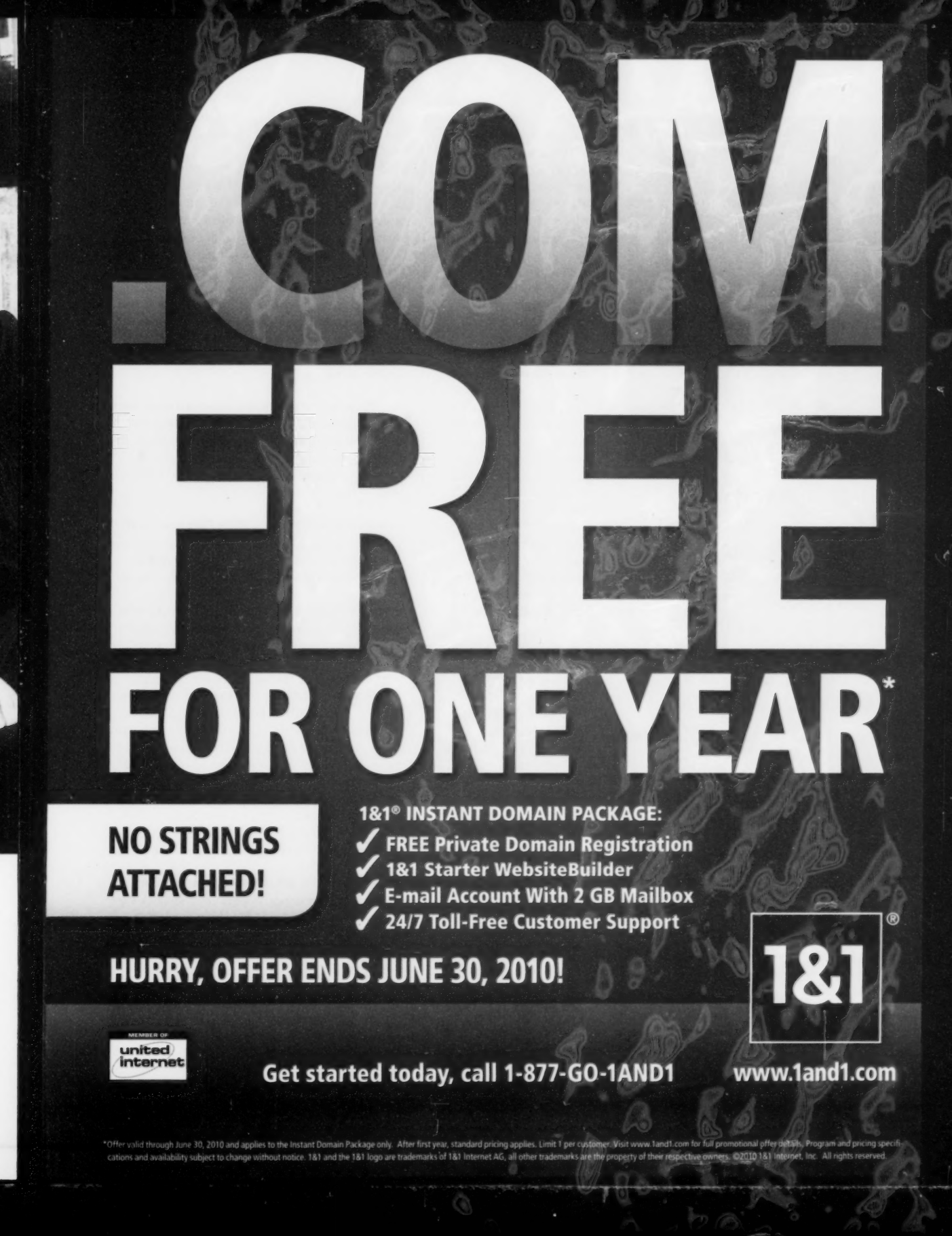


JERRY MARKATOS

FRED BROOKS *helped define computer software, in deed as well as word. He served as project manager for, and thus as "father" of, the IBM System/360 and led the design of its operating system. In his classic 1975 book* The Mythical Man-Month, *he coined Brooks' Law, which states that "adding manpower to a late software project makes it later." He left IBM in 1964, when the System/360 was introduced, to start the computer science department at the University of North Carolina at Chapel Hill. Today, at age 79, he's still teaching and has published a new book,* The Design of Design: Essays From a Computer Scientist *(Addison-Wesley Professional, April 2010).*

You're famous for Brooks' Law, but you also said that when building something, "you should plan to throw one away. You will anyway." That was the first edition of *The Mythical Man-Month*. In the second edition, I say that was misguided! You ought to

Continued on page 12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Continued from page 10

plan to continually iterate on it, not just build it, throw it away and start over. Some of the things I said in 1975 were wrong, and in the second edition, I correct them.

In your new book, you draw on your experiences designing things such as a beach house. Are you trying to get people in programming to look beyond software? That's my central thesis. There are these invariants across mediums in which one designs. Let's try to identify these invariants and learn from the older design businesses.

> **If you're designing something new,** find and choose your chief designer and trust them to do it their way instead of putting all kinds of shackles around them.

In IT, a long-held belief is that business people don't understand technology and tech people don't understand business. Is that a truism? I don't think it is. It's true that some business people don't understand tech and some tech people have no interest whatsoever in business. But the pointy-headed boss in *Dilbert* is a caricature. It characterizes some situations where we have bosses running software projects who don't understand what software is about. I think that's no longer the prevailing situation.

You raise the idea of the team vs. the individual designer and how we've shifted toward team design in part because things have become so complex. What about Steve Jobs? Is he an exception to the broader rule you're discussing? He's unquestionably a great designer in that he has the vision of what the product ought to be. [Polaroid founder] Ed Land was the same way. Now, what Land did and what Jobs did is gather a team of people with the various skills to realize the vision. Jobs doesn't do [everything], but he sees the things to be done and casts that vision before a team that can realize it.

What about the rest of us? How are we supposed to make something great? The secret is to start with a vision of what will be useful, why it will be useful. Ed Land said, in an annual report from Polaroid, what you do is you start with a vision of the product and one by one remove the technical obstacles until it's realized. That's a nice way of thinking.

My net message is, if you're designing something new, find and choose your chief designer and trust them to do it their way instead of putting all kinds of shackles around them. Give them authority over what the design should be. As far as I can tell, when [architect] Christopher Wren was entrusted with building those 66 churches in London after the big fire [of 1666], they don't seem to have nitpicked him. The famous Lockheed Skunk Works — they locked the door, let the people go off, and they came back with a radar-invisible airplane. We had watchbirds galore [for the System/360], but at the final sprint, I shut them out.

You also note that organizations often behave worse than individual members of the group would on their own. Why is that? I don't fully understand that. There's something about peer-group pressure that encourages people to cross bounds they wouldn't cross by themselves.

How can we curb that *Lord of the Flies* tendency? I think it's leadership. You train individuals to have character enough not to go along with the stream. And that has to be done at home and in the schools.

What's the state of computer science education in the U.S.? Our Achilles' heel is elementary and middle school preparation. We are not getting as many people prepared to go into technology — and well prepared to go into technology — as we should.

I see some remarkable accomplishments happening in strong schools. But I see disaster happening in many, many schools. I think there are organizational reasons why that's true. I think the teaching profession is not paid and recognized as well relative to other professions. As a consequence, I don't think that many people who two generations ago would have gone into teaching go into teaching anymore. I also think that bureaucratic requirements put on teachers now hamper teaching of a lot of substance.

What can we do to get kids more interested in technology? The critical place is middle school. We're doing a lot of things. Lab visits where people go out and talk to the schools. We're doing science fairs; we bring people into our labs. The scientific community is really concerned with trying to get more people interested.

But there are two issues: One of them is getting them interested, and the other is seeing to it that they get the mathematics foundation, particularly in middle school. If they didn't get the algebra at the right time, or they got turned off on science, the trouble goes on and on.

– *Interview by* **Michael Fitzgerald,** *a freelance writer in Millis, Mass. (michael@mffitzgerald.com)*

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THORNTON A. MAY

IT's Human Energy Crisis

Many of the IT people I meet are exhausted.

WORD ASSOCIATION TIME: When I say "IT energy," what do you think of? After everything that's been written in the past couple of years about green IT and the amount of electricity that's needed to power data centers, you probably think first about the cost of our profligate energy consumption.

That's a worthy concern, but I propose that the phrase "IT energy" should make you think instead about something even more important: the vital human energy level of IT leaders, managers and workers. An essential question for all IT leaders to ponder is whether their IT organization is exothermic (that is, one that releases positive energy) or endothermic (one that sucks energy out of the enterprise). Research being conducted at the IT Leadership Academy and the CIO Solutions Gallery at the Fisher College of Business at Ohio State University indicates that many — indeed, most — North American and European companies are facing a major human energy crisis in IT.

Many of the IT people I meet are exhausted. Head count is decreasing, and workload is increasing. User expectations and regulatory requirements are expanding exponentially. A study analyzed the impact of multitasking and determined that most digitally aware people now work a 43 hours a day (that's not a typo; it's serious multitasking). It is very understandable that IT people are tired. And tired is not a good thing in the hyperaccelerated world we are heading into.

If we do not do something, the IT fatigue factor will get worse. An emerging trend is for world-class organizations to benchmark IT not against line-of-sight competitors in the same vertical market, but against "best imaginable" practitioners. The IT performance bar is being raised. The question is, will IT have the energy to respond?

Best-selling author Malcolm Gladwell recently took a look at successful people in all disciplines. He concluded, "If you look closely at CEOs — the people at the very upper echelons of corporations — the thing that is most striking about them is their physical stamina. At the end of the day, it is that quality, perhaps more than anything else, that is separating them from us."

Re-energizing IT

Next-generation CIOs will have to manage and increase the human energy levels of their teams. Just as we meter devices to determine their energy consumption, so too will IT leaders meter the people, processes and technology sets deployed in the enterprise to determine impact on IT energy level.

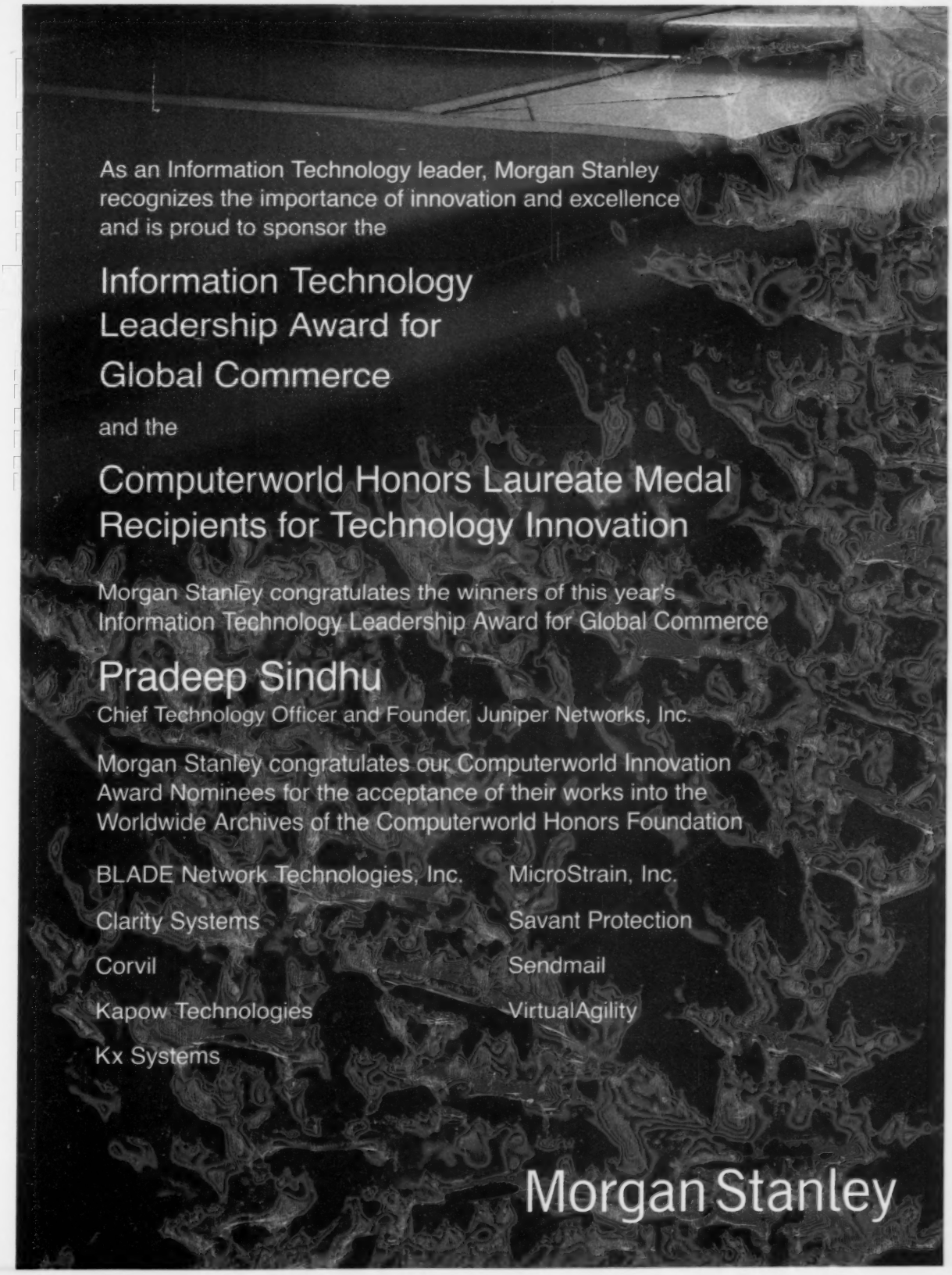
Job 1 is to take advantage of the economic downturn and remove from the enterprise energy vampires — people who are always negative. Every organization has them. One way energy vampires suck the energy out of others is that they are so negative, more positive people expend energy trying not to spend time with them.

Job 2, on the process side, is to rationalize IT finances. A major energy sink and morale-buster in many IT organizations is the lack of a decent IT accounting system. World-class IT accounting is *very* exothermic. Knowing your costs and the value that IT generates for the business releases all kinds of positive energy. William Miller, the controller at Nationwide Services Co., has created a second-to-none IT accounting system. Diane Bryant and her team at Intel annually publish a report of the value that IT delivers.

And Charlie Feld, former CIO at Frito-Lay, Delta Airlines and Burlington Northern Santa Fe Railroad and author of *Blind Spot: A Leader's Guide to IT-Enabled Business Transformation*, sees another problem. He believes that IT has become dangerously overspecialized. Having to work through multiple noncommunicating silos of IT expertise consumes a lot of energy.

And excessive energy consumption is as detrimental in the IT department as it is in the data center. ◆

Thornton May is the author of *The New Know: Innovation Powered by Analytics* and executive director of the IT Leadership Academy at Florida State College at Jacksonville.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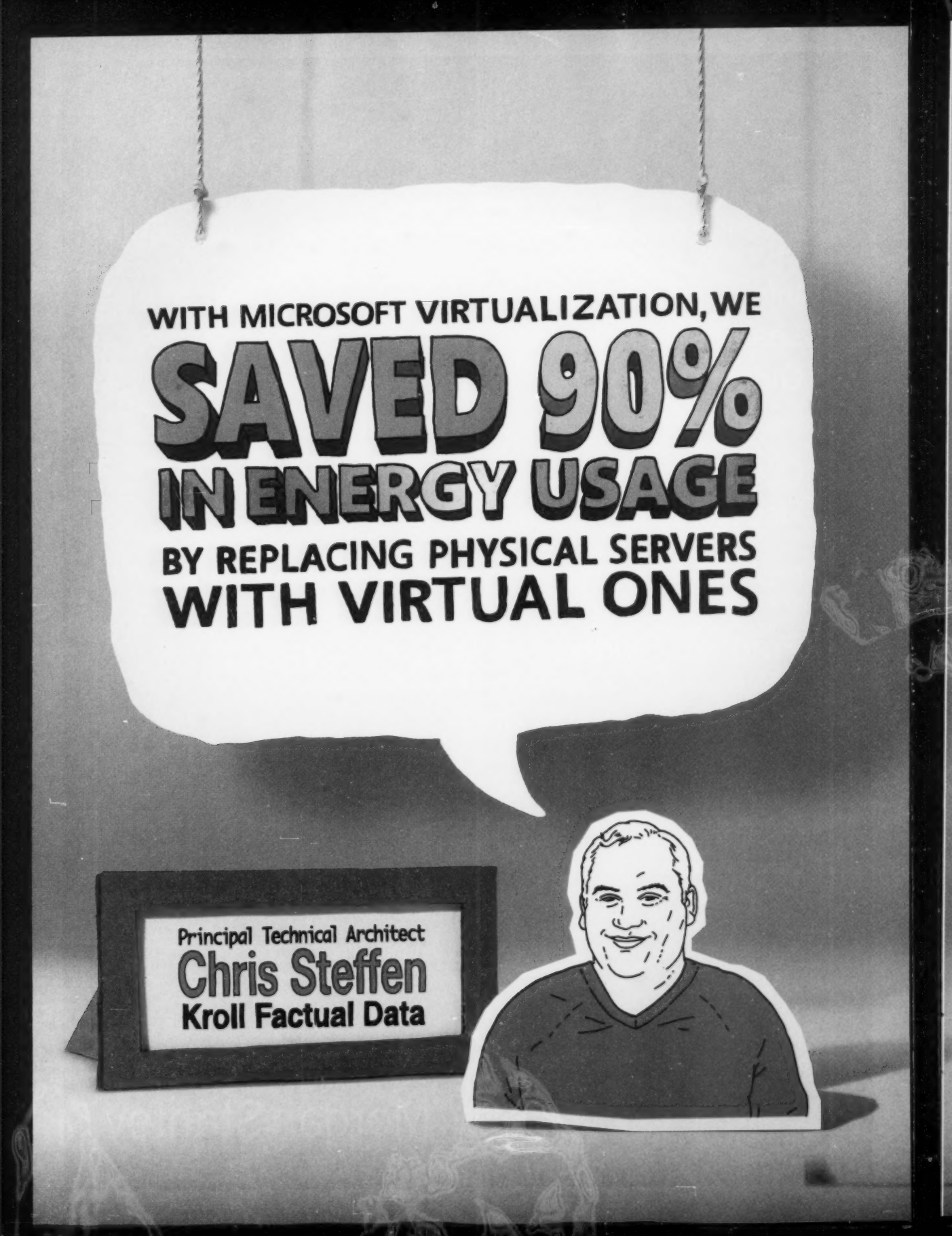
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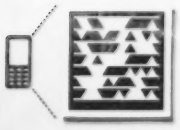

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CLOUD SECURITY: Oxymoron?

Here's how some early adopters of cloud computing are approaching the problem.

By Elisabeth Horwitt

COVER STORY

FOR LOGIQ³ INC., the decision to go with a cloud-based provider of infrastructure as a service (IaaS) was a matter of cost and flexibility.

A start-up that began operations in 2006, the Toronto-based life reinsurance management firm could not afford to build and staff a data center from scratch, according to David Westgate, Logiq³'s vice president of technology. So the company instead chose cloud computing and managed IT services provider BlueLock LLC to handle its data needs.

BlueLock's virtualized environment allowed data and volumes to move between systems in a dynamic, low-cost way that would be impossible with a traditional, hosted environment, Westgate says.

There were, however, security concerns to be addressed before Logiq³ would entrust its critical systems to BlueLock's cloud. The company handles

Five Tips for Effective Cloud Security

- **Find out as much as you can about a software-as-a-service provider's security measures and infrastructure.** If you plan to work with an infrastructure-as-a-service provider, ask what tools it uses to protect virtual environments.
- **Encrypt data at rest and in transit.** Otherwise, don't put sensitive information in the cloud.
- **Divvy up responsibilities between your administrators and the service provider's administrators,** so no one has free access across all security layers.
- **Check whether a vendor has been accredited as meeting SAS 70 Type 2 and ISO 27001 security standards.** If you're with an international company, check for European Safe Harbor accreditation as well.
- **Go with a high-end service provider with an established security record.** "You get what you pay for," says Gartner analyst Jay Heiser.

– ELISABETH HORWITT

death records, which include personal information like social security numbers, as well as financial data and information about major assets that its large financial customers have on their books.

Although Logiq³ isn't regulated by the U.S. government's Sarbanes-Oxley Act, its customers in the financial sector are, "so they'll be auditing us," says Westgate. As a result, Logiq³ needed potential cloud vendors to demonstrate that they were in compliance with applicable regulations and could provide high levels of security.

Logiq³ is far from alone. While security and compliance issues crop up in any Web-based outsourcing arrangement, businesses are justifiably concerned about putting everything in a virtualized cloud. It's a comparatively new service area where risks are unknown — "which in itself is a risk," says Jay Heiser, an analyst at Gartner Inc. "If I can't figure out how risky something is, I have to assume it isn't secure."

The extent to which hackers can take advantage of unique cloud vulnerabilities is being hotly debated among IT professionals like those in the Cloud Security Alliance's LinkedIn group. So far, there have been few instances of successful, large-scale data breaches on public clouds. Last winter, however, someone managed to set up the Zeus password-stealing botnet inside Amazon.com Inc.'s EC2 cloud computing infrastructure by first hacking into a Web site that was hosted on Amazon servers.

In other words, it's early days yet in the cloud computing industry. Cloud vendors are, in some instances, playing catch-up on the security front, and IT managers are trying to figure out exactly what the risks are and how to counter them.

[Cloud vendors] may have incredibly secure and robust systems, but there's no sensible way to ensure this.

JAY HEISER, ANALYST, GARTNER INC.

A crucial first step is for cloud-based service providers and their potential clients to sit down and determine who will have responsibility for securing and protecting specific components of the IT infrastructure, which often spans both companies' systems.

Sometimes, particularly with an IaaS provider, the division of labor is negotiable. For example, Westgate decided to let BlueLock handle Logiq³'s patching and configuration management because he was familiar with the software BlueLock was using, a tool from Shavlik Technologies LLC.

The division of labor between Logiq³ and BlueLock actually strengthened security, because "no one person or company has all the keys to the kingdom," says Westgate. Because BlueLock manages the firewall, for example, "none of my admins can go in and decide to sell or move the data," he notes. "And BlueLock admins can't do it either, because they don't control the systems."

How much responsibility lies with the cloud-based service provider largely depends on the type of service.

With an IaaS setup, the customer is usually responsible for protecting everything above the middleware and APIs, including the applications and operating system, says Todd Thiemann, senior director of security vendor Trend Micro Inc.'s data protection group. The terms of service for Amazon's IaaS offering, for example, state that the customer is responsible for protecting the data it puts into the public cloud, he adds.

In contrast to IaaS arrangements, in software-as-a-service deals, the provider is usually responsible for protecting whatever customer applications and data reside on its cloud. That setup often works well for budget-challenged businesses, because it gives them access to advanced security technologies and resources that they might not be able to afford in-house.

IBM's LotusLive SaaS offering, for example, uses "the same standards, security, compliance and governance we use to run major business systems for some very large and important companies," says Sean Poulley, IBM's vice president of online collaboration services. LotusLive data centers are protected by physical and biometric controls, including closed-circuit TV. Access control is handled by IBM's enterprise-scale Tivoli software.

However, many providers of cloud-based services — particularly SaaS vendors — feel that their security practices and technologies give them a competitive advantage, so they don't like to talk about how they approach security. That means companies have to take the vendor's word that its systems are indeed secure and compliant.

"Vendors have done little to accommodate security risk evaluation," says Gartner's Heiser. "They

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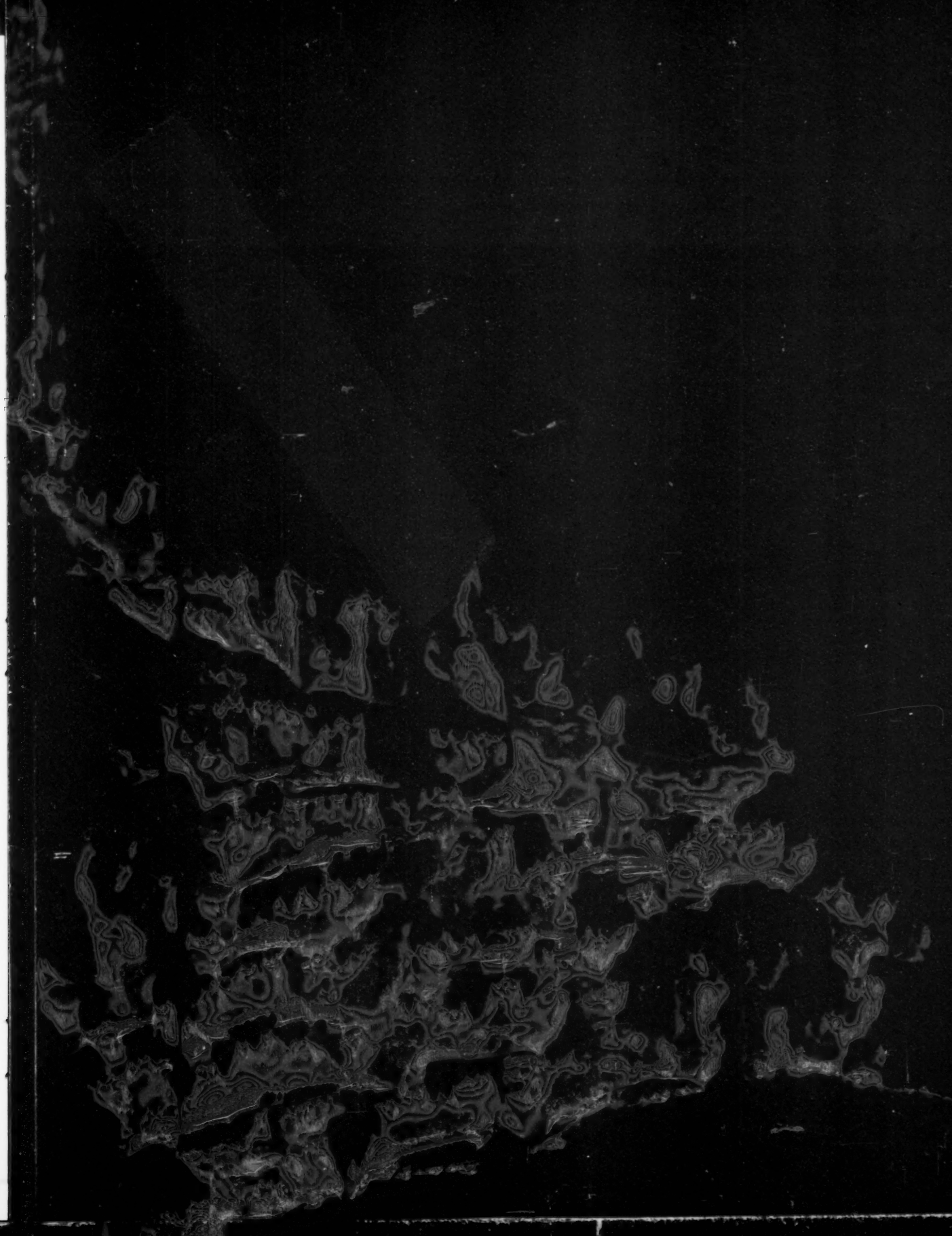

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Security accreditation standards such as ISO 27001 and SAS 70 Type 2 provide some assurance, he adds, noting that "27001 is more relevant to cloud security issues but weak when applied to new forms of technology."

Playing Nicely Together

Many SaaS vendors are understandably reluctant to have a customer insert third-party security products into their proprietary platforms, even if it's just an agent that would permit a customer's security system to interact with theirs.

For example, Pfizer Inc. had outsourced some security services to D3 Security Management Systems Inc. and was interested in using Oracle Corp.'s Access Manager in D3's incident management applications. But D3 expressed concerns about installing Oracle agents on its systems, says Kurt Anderson, the pharmaceutical company's manager of global operations business technology.

Anderson solved the problem by using Symplified Inc.'s Single-Point Cloud Access Manager, which does not use an agent but rather interacts with D3's published APIs, he says.

Since IaaS customers technically own their virtualized slice of a vendor's infrastructure, they can install security software and controls. However, only a few vendors provide products that can protect both private- and public-cloud-based environments.

One such product is Trend Micro's Deep Security 7. Once its agent is installed in a private or public cloud infrastructure, it can perform deep packet inspection, monitor event logs and monitor system activity, such as file changes, for unauthorized actions, Thiemann says.

Shavlik, a vendor that provides systems management for private cloud installations, tackles public cloud security from a different angle. It licenses its patch and configuration management and compliance-monitoring software to cloud-based service providers — including its own IaaS provider, says Mark Shavlik, the company's CEO.

Cloud-based service providers are catching on to the fact that using an established commercial security product can attract customers. For Logiq³'s Westgate, BlueLock's use of Shavlik's software was a definite selling point. "I am very familiar with Shavlik. I've been using it for patch and configuration management for years," he says.

The dynamic, flexible resource provisioning that makes virtualization and cloud services so attractive to cost-challenged IT executives also makes it difficult to track where data is located at any given time, and who is accessing it. This is true in private clouds, and even more so in public-cloud-based systems, where access control has to be correlated between the customer and the service provider — and often several service providers.

Pfizer uses Symplified's Single Point Cloud Access Manager to provide single sign-on functionality across different SaaS providers and applications. When an end user moves between an Oracle- and a Symplified-managed domain, for example, he has to log on again, but he can use the same credentials, Anderson says.

Symplified and Ping Identity Corp. are two vendors that currently provide single sign-on systems for both internal and SaaS cloud-based applications, using federated identity technology that coordinates user identity and access management across multiple systems. However, Anderson feels that it's up to the SaaS vendors to adopt a more holistic and standardized form of access management so the customer will no longer have to bear that burden.

Another access management concern when dealing with a cloud-based service — or any outsourced service, for that matter — is how to ensure that the service provider's system administrators don't abuse their access privileges. Again, SaaS customers don't have a lot of control or oversight regarding how the service provider addresses that issue. IaaS providers, in contrast, will often allow a customer to install event log monitoring software on their virtualized portion of the infrastructure.

Logiq³, for instance, uses Sentry Metrics Inc.'s security event management service, which monitors event logs, performs trend analysis and reports on anomalies. So the Sentry Metrics system could, for example, alert Logiq³ when a BlueLock administrator logs on but hasn't been given a specific job to do, Westgate says.

Customer control and monitoring of a carrier's cloud can only go so far, however, no matter what the type of service. So how do you ensure that sensitive data is adequately secured and protected?

Service-level agreements with monetary penalties don't cut it, says Pfizer's Anderson, especially for a Fortune 50 company, since "the small amount they get back is a pittance" compared

Continued on page 24

Educating Workers About Cloud Risks

Many companies that want the cost benefits of cloud-based services but still have security concerns tell their end users not to put sensitive data into the cloud. But that's generally an exercise in futility, according to Gartner analyst Jay Heiser.

"The problem is that users often don't know what's sensitive and probably won't follow the rules anyway," Heiser says. "You can assume that any application or data service end users can pump with data will get sensitive data eventually."

» Kurt Anderson

Pfizer is in the process of establishing a SaaS center of excellence to educate users about the correct way to use SaaS systems, says Kurt Anderson, the pharmaceutical company's manager of global operations business technology.

In addition, Anderson's group is establishing best practices for procurement of SaaS. Among other things, those best practices forbid applications that involve competitive or personally identifiable information from being included in a SaaS setup.

– ELISABETH HORWITT

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Five Tips for Picking A Cloud IT Provider

Cara Beston, a partner at PricewaterhouseCoopers, says companies should select a cloud services provider with the following characteristics:

- **Commitment to service-level agreements.** Find a provider that's willing to negotiate an SLA that meets your needs. Make sure you can live with its guaranteed uptime, and don't pay for capacity you won't use. Learn exactly how you will be billed.
- **Security and privacy expertise.** There's no security panacea, but see if the vendor can tailor security to fit the specific risks, size and regulatory climate of your operation.
- **Regular checkups.** Choose a provider that gets periodic audits by a qualified third party.
- **Full disclosure.** A trustworthy provider will promptly report any major security breaches and threats — and provide details about its response plan.
- **Financial stability.** Your provider should have the financial stamina to keep your systems up and running for the long haul. Check out its balance sheet, investors and long-term prospects.

— MITCH BETTS

Continued from page 22

with the cost of a major security breach.

Therefore, due diligence is critical, Anderson says. Pfizer uses SAS 70 Type 2 certification, in which an independent third party audits the service provider's internal and data security controls. Anderson also verifies the vendor's level of compliance with Europe's Safe Harbor privacy rules, and he checks Dun & Bradstreet research to make sure it's legitimate.

The ISO 27001 security standard, for its part, defines best practices for designing and implementing secure and compliant IT systems.

While such standards provide a useful starting point, their criteria tend to be generic, says Gartner's Heiser. Companies still need to match a service provider's specific controls to their specific requirements, he adds.

For example, after checking out BlueLock's SAS 70 Type 2 accreditation, Logiq3's IT staff did a further evaluation to "make sure the controls we require are supported by the controls they have in place," Westgate says. His team then followed up on discrepancies, identifying missing controls and working with the vendor on solutions. The company plans to repeat the process at least once a year, he says.

The Daisy Chain

Basic security tasks such as access control and rights management become even more complicated when, as often happens, a SaaS provider outsources its infrastructure or development platform to another cloud-based service provider — adding yet another variable to the equation.

Take the case of Cloud Compliance Inc., which provides access control monitoring services for private cloud environments. The company entrusted its infrastructure to Amazon because it's the most proven service provider, according to Cloud Compliance founder Robbie Forkish. However, he acknowledges that the arrangement introduces potential security problems. "There are certain areas where we, as a consumer of their services, need to fill in security capabilities they lack" in order to meet Cloud Compliance's internal security requirements and to reassure its customers.

For example, the company encrypts data in transit and gives customers the option of either encrypting data at rest — on Cloud Compliance's Amazon-hosted servers — or not putting any data in the cloud.

The latter option involves a performance hit, since customers have to reupload data into the cloud every time an application is run, but some customers accept that trade-off in return for a higher level of security, Forkish notes.

Cloud Compliance's external customers do ask about Amazon's security, Forkish says. The concerns they raise change from month to month, depending on what vulnerabilities the press has been writing about, he adds. Cloud Compliance will either address their concerns or, if it can't, pass them on to Amazon.

"In some cases, we don't get a response, and we figure this is a real issue but they're working on it," Forkish says. But the Zeus botnet incident on Amazon, he says, "as far as we can tell, was not a threat over and above what we would expect for an Internet service, cloud-based or not."

Compliance Challenges

Public clouds add a whole new set of issues to regulatory compliance — issues that providers, users and regulators themselves are just starting to look at. HIPAA and Sarbanes-Oxley privacy and data-retention requirements weren't designed with cloud-based services in mind.

"IT staffs have to figure out new ways to analyze and assess risk, and how to meet compliance requirements," Forkish notes. "Many compliance standards require being able to point to where data is, which is impossible with a cloud. And there's legal discovery — getting access to data when required. Can discovery be done by a third party without your knowledge because it resides on cloud storage? These are examples of things I think will be worked out over the next couple of years."

In the meantime, Forkish suggests, many businesses, especially those in highly regulated industries, will entrust their sensitive data to private clouds or traditional managed services "and maintain the status quo."

And then there are the pioneers, like Logiq3's Westgate, who says he sees cloud computing as "a natural evolution of how we are managing systems." The key question about this evolution, he says, "is not why, but why not?" ◆

Horwitt *is a freelance reporter and former* Computerworld *senior editor based in Waban, Mass. Contact her at ehorwitt@verizon.net.*

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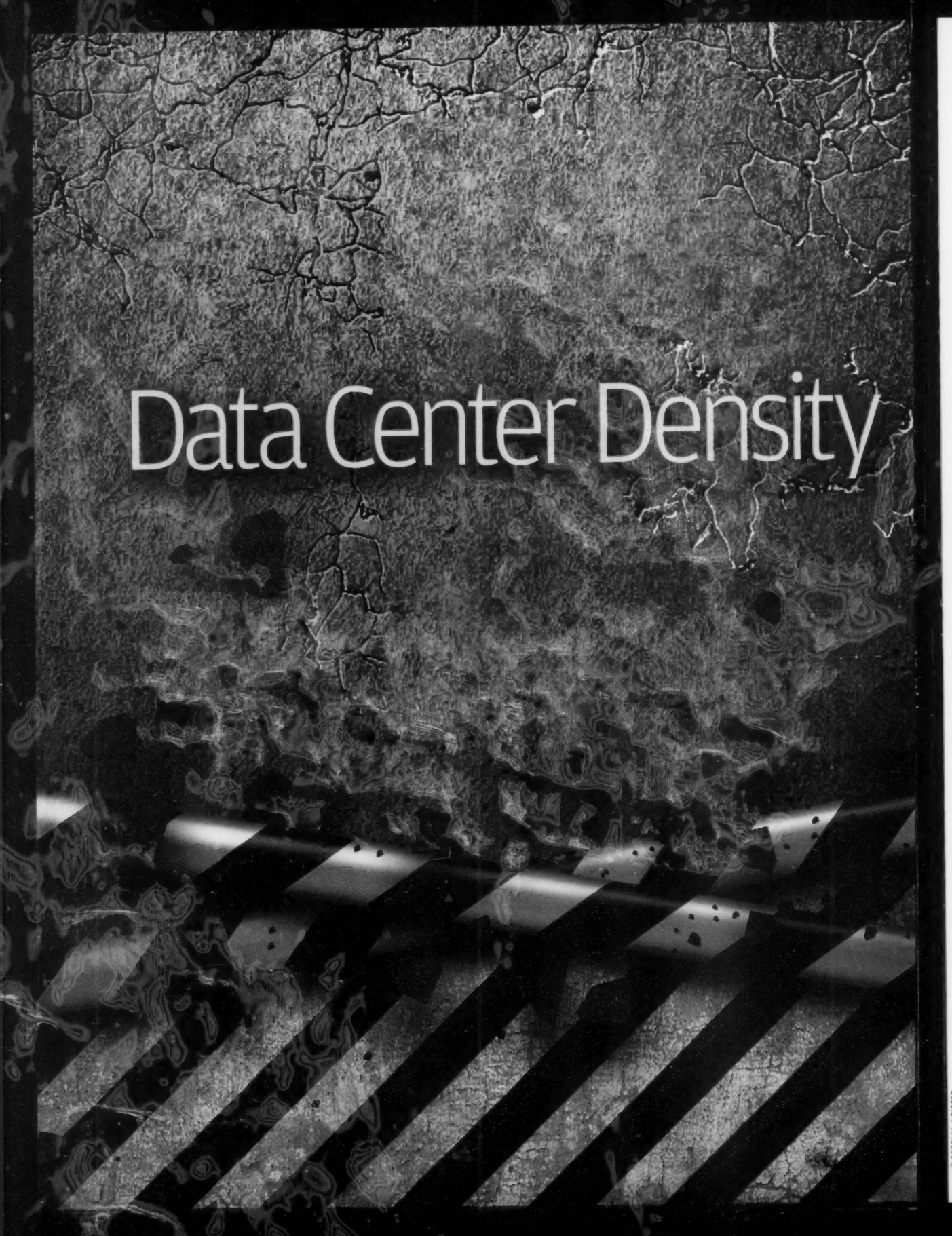
Data Center Density

Hits the Wall

WHY THE ERA OF PACKING MORE SERVERS INTO THE SAME SPACE MAY HAVE TO END.

BY ROBERT L. MITCHELL

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DATA CENTERS

INDUSTRIAL LIGHT & MAGIC has been replacing its servers with the hottest new IBM BladeCenters — literally, the hottest. For every new rack ILM brings in, it cuts overall power use in the data center by a whopping 140 kilowatts — a staggering 84% drop in overall energy use.

But power density in the new racks is much higher: Each consumes 28 kW of electricity, versus 24 kW for the previous generation. Every watt of power consumed is transformed into heat that must be removed from each rack — and from the data center.

The new racks are equipped with 84 server blades, each with two quad-core processors and 32GB of RAM. They are powerful enough to displace seven racks of older BladeCenter servers that the special-effects company purchased about three years ago for its image-processing farm.

To cool each new 42U rack, ILM's air conditioning system must remove more heat than would be produced by nine household ovens running at the highest temperature setting.

These days, most new data centers have been designed to support an average density of 100 to 200 watts per square foot, and the typical cabinet is about 4 kW, says Peter Gross, vice president and general manager of Hewlett-Packard Co.'s Critical Facilities Services. A data center designed for 200 watts per square foot can support an average rack density of about 5 kW. With carefully engineered airflow optimizations, a room air conditioning system can support some racks at up to 25 kW, he says.

At 28 kW per rack, ILM is at the upper limit of what can be cooled with today's computer room air conditioning systems,

says Roger Schmidt, an IBM fellow and chief engineer for data center efficiency. "You're hitting the extreme at 30 kW. It would be a struggle to go a whole lot further," he says.

Is This Sustainable?

The question is, what happens next? "In the future, are watts going up so high that clients can't put that box anywhere in their data centers and cope with the power and cooling? We're wrestling with that now," Schmidt says. High-density computing beyond 30 kW will have to rely on water-based cooling, he says. But other experts say that data center economics may make it cheaper for many organizations to spread out servers rather than concentrate them in racks with ever-higher energy densities.

Kevin Clark, director of information technologies at ILM, likes the gains in processing power and energy efficiency he has achieved with the new BladeCenters, which have followed industry trends to deliver more bang for the buck. According to IDC, the average server price since 2004 has dropped 18%, while the cost per core has dropped by 70%, to $715.

But Clark wonders whether continually doubling compute density is sustainable. "If you double the density on our current infrastructure, from a cooling perspective, it's going to be difficult to manage," he says.

He's not the only one who's concerned. For more than 40 years, the computer industry's business model has been built on the assumption that Moore's Law will prevail and that compute density will double every two years in perpetuity. Now some engineers and data center designers question whether that's feasible — and whether a threshold has been reached.

The threshold isn't just about whether chip makers can overcome the technical challenges of packing transistors even more densely, but whether it will be economical to run large numbers of extremely high density server racks in modern data centers.

The newest equipment concentrates more power into a smaller footprint on the raised floor, but the infrastructure needed to support every square foot of high-density compute space — including cooling systems, power distribution equipment, UPSs and generators — is getting proportionally larger.

Data center managers are taking notice. In a 2009 IDC survey of 1,000 IT sites, 21% of the respondents ranked power and cooling as the No. 1 data center challenge. Nearly half (43%) reported increased operational costs, and one-third said that they had experienced server downtime as a direct result of power and cooling issues.

Christian Belady is the lead infrastructure architect in Microsoft Corp.'s Global Foundation Services group, which designed and operates the company's newest data center in Quincy, Wash. He says the cost per square foot of a raised floor is too high. In the Quincy data center, he says, infrastructure costs accounted for 82% of the total project. "We're beyond the point where more density is better," Belady says. "The minute you double compute density, you double the footprint in the back room."

As compute density per square foot increases, overall electromechanical costs tend to stay about the same, Gross says. But because power density also increases, the ratio of electromechanical floor space needed to support a square foot of high-density compute floor space also goes up.

IBM's Schmidt says the cost per watt, not the cost per square

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Energy-Saving Tips For the Data Center

Refresh your servers. Each new generation of servers delivers more processing power per square foot — and per unit of power consumed. For every new BladeCenter rack Industrial Light & Magic has installed, it has been able to retire seven racks of older blade technology. Total power savings: 140 kW.

Charge users for power, not just space. "You can be more efficient if you're getting a power consumption model along with square-footage cost," says Ian Patterson, CIO at Scottrade.

Use hot aisle/cold aisle designs. Good designs, including careful placement of perforated tiles to focus airflows, can help data centers keep cabinets cooler and turn the thermostat up.

Look for the most efficiently designed servers. Hardware that meets the EPA's Energy Star specification offers features such as power management, energy-saving power supplies and variable-speed fans. It may cost more upfront, but it typically costs less to operate over the long haul.

Consider cold-aisle containment. Once you have a hot aisle/cold aisle design, the next step for cabinets exceeding about 4 kW is to use cold-aisle containment techniques. This may involve closing off the ends of aisles with doors, using ducting to target cold air and installing barriers atop rows to prevent hot air from circulating over the tops of racks.

Use variable-speed fans. Computer room air conditioning systems rely on fans, or air handlers, to push cold air in and remove hot air from the space. A reduction in fan speed of 12.5% cuts power use in half.

Turn on power management. Most servers ship with energy-saving technologies that do things like control cooling-fan speeds and step down CPU power during idle times, but it's not turned on by default — and many data centers still don't enable it. Consider enabling it by default, except in environments where high availability and fast response times are mission-critical.

Create zones. Break the data center floor into autonomous zones, where each block of racks has its own dedicated power and cooling resources. Zoning involves careful separation of hot and cold air but usually doesn't require that an area be physically partitioned off.

Douse hot spots with closely coupled cooling. A series of high-power-density racks can create a hot spot that the room air conditioning system can't handle, or that forces IT to overcool the entire room to address a few cabinets. In those cases, consider supplemental spot-cooling systems. These require piping chilled liquid — either water or glycol — to a heat exchanger that's either attached or adjacent to a high-density cabinet.

Retrofit for efficiency. While new data center designs are optimized for cooling efficiency, many older ones still have issues. If you haven't done the basics, optimizing perforated-tile placements in the cold aisle or putting blankets over cabling in the floor space are good places to start.

Install temperature monitors. It's not enough to monitor the room temperature. Adding more sensors allows better control in the row or rack.

Turn up the heat. The key to raising efficiency is increasing your intake temperatures on the cabinets. The higher the intake temperature, the more energy-efficient the data center. While you probably can't cool an entire cabinet with the room set at 81 degrees at the intake, you probably don't need to be setting the temperature as low as 65, either.

— ROBERT L. MITCHELL

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foot, remains the biggest construction expense for new data centers.

"Do you hit a power wall down the road where you can't keep going up this steep slope? The total cost of ownership is the bottom line here," he says. Those costs have for the first time pushed some large data center construction projects past the $1 billion mark. "The C-suites that hear these numbers get scared to death because the cost is exorbitant," Schmidt says.

Ever-higher energy densities aren't sustainable from an energy use or cost perspective, says Rakesh Kumar, an analyst at Gartner Inc. Fortunately, most enterprises still have a ways to go before they see average per-rack loads in the same range as ILM's. About 40% of Gartner's enterprise customers are pushing beyond the range of 8 to 10 kW per rack, and some are as high as 12 to 15 kW per rack. But those numbers are creeping up.

In response, some enterprise data centers, and managed services providers like Terremark Inc., are monitoring power use and factoring it into what they charge for data center space. "We're moving toward a power model for larger customers," says Ben Stewart, senior vice president of engineering at Terremark. "You tell us how much power, and we'll tell you how much space we'll give you."

The hot/cold aisle approach is traditional but not optimal. The move now is to go to containment.

ROCKY BONECUTTER, DATA CENTER TECHNOLOGY AND OPERATIONS MANAGER, ACCENTURE PLC

Buying Kilowatts

But is it realistic to expect customers to know not just how much equipment they need hosted, but how much power will be needed for each rack of equipment?

"For some customers, it is very realistic," Stewart says. In fact, Terremark is moving in this direction in response to customer demand. "Many of them come to us with a maximum-kilowatt order and let us lay the space out for them," he says. If a customer doesn't know what its energy needs per cabinet will be, Terremark sells power per "whip," the power cable feed to each cabinet.

IBM's Schmidt thinks further power-density increases are possible, but the methods by which data centers cool those racks will need to change.

ILM's data center, completed in 2005, was designed to support an average load of 200 watts per square foot. The design has plenty of power and cooling capacity overall. It just doesn't have a way to efficiently cool the high-density racks.

ILM uses a hot aisle/cold aisle design, and the staff has successfully adjusted the number and position of perforated tiles in the cold aisles to optimize airflow around the carefully sealed BladeCenter racks. But to avoid hot spots, the room air conditioning system is cooling the entire 13,500-square-foot raised floor space to a chilly 65 degrees.

Clark knows it's inefficient; today's IT equipment is designed to run at temperatures as high as 81 degrees, so he's looking at a technique called cold-aisle containment.

Other data centers are experimenting with containment — high-density zones on the floor where doors seal off the ends of either the hot or cold aisles. Barriers may also be placed along the top of each row of cabinets to prevent hot and cold air from mixing near the ceiling. In other cases, cold air may be routed directly into the bottom of each cabinet, pushed up to the top and funneled into the return-air space in the ceiling plenum, creating a closed-loop system that doesn't mix with room air at all.

"The hot/cold aisle approach is traditional but not optimal," says Rocky Bonecutter, manager of data center technology and operations at Accenture PLC. "The move now is to go to containment."

HP's Gross estimates that data centers that use such techniques can support up to about 25 kW per rack with a computer room air conditioning system. "It requires careful segregation of cold and hot, eliminating mixing, optimizing the airflow. These are becoming routine engineering exercises," he says.

While redesigning data centers to modern standards has helped reduce power and cooling problems, the newest blade

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The Pros and Cons Of Hot Data Centers

Raising the operating temperature of servers and other data center gear doesn't always save on cooling costs. Most IT manufacturers increase fan speeds for servers and other equipment as temperatures exceed about 77 degrees Fahrenheit to keep the processor and other component temperatures constant, says IBM fellow Roger Schmidt. At temperatures above 77 degrees, the speed of fans in most servers sold today increases significantly and processors suffer higher current leakage.

Power consumption increases as the cube of the fan speed — so if speed increases by 10%, that means a 33% increase in power. At temperatures above 81 degrees, data center managers may think they're saving energy when in fact servers are increasing power usage at a faster rate than what is saved in the rest of the data center infrastructure.

BOTTOM LINE: You would still save energy overall if you raised the temperature to 81, but going higher presents challenges to systems and component designers. Could equipment be designed to operate at higher temperatures? Possibly, Schmidt says. "Manufacturers will have to come together as a group to determine whether we should recommend a higher limit that will, in fact, save energy at the data center level."

Tom Bradicich, an IBM vice president, says that with all of the different equipment in a data center, getting the facility optimized for 81 degrees is difficult. Even getting the components in the boxes IBM builds to meet the current spec can be a challenge. "We're working in a world where we integrate a lot of third-party components," Bradicich says. "At the end of the day, IBM doesn't make the microprocessor and other components."

Dylan Larson, director of data center technology initiatives at Intel Corp., thinks the day when everything in a data center can run safely at 81 degrees is still a long way off. "There's a reliability concern people have when it comes to running data centers at higher temperatures," he contends. "Until the industry says, 'We're going to warranty these things for higher temperatures,' we're not going to get there."

— ROBERT L. MITCHELL

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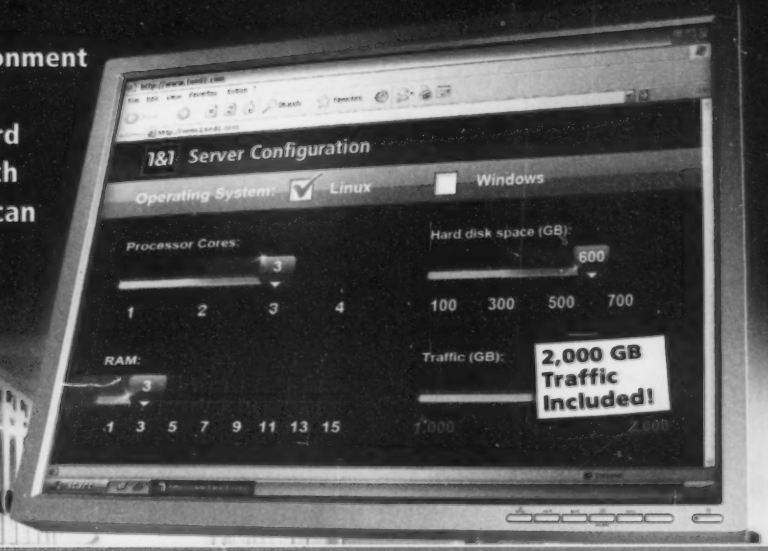

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servers are already exceeding 25 kW per rack. IT has spent the past five years tightening up racks, cleaning out raised floor spaces and optimizing airflows. The low-hanging fruit is gone in terms of energy efficiency gains. If densities continue to rise, containment will be the last gasp for computer-room air cooling.

Time for Liquid Cooling?

Some data centers have already begun to move to liquid cooling to address high-density hot spots. The most common technique, called closely coupled cooling, involves piping chilled liquid, usually water or glycol, into the middle of the raised floor space to supply air-to-water heat exchangers within a row or rack. Kumar estimates that 20% of Gartner's corporate clients use this type of liquid cooling for at least some high-density racks.

IBM's Schmidt says data centers with room-based cooling — especially those that have moved to larger air handlers to cope with higher heat densities — could save considerable energy by moving to liquid cooling.

But Microsoft's Belady thinks liquid's appeal will be limited to a single niche: high-performance computing. "Once you bring liquid cooling to the chip, costs start going up," he contends. "Sooner or later, someone is going to ask the question: Why am I paying so much more for this approach?"

The best way to take the momentum away from ever-increasing power density is to change the chargeback method for data center use, says Belady. Microsoft changed its cost allocation strategy and started billing users based on power consumption as a portion of the total power footprint of the data center, rather than basing it on floor space and rack utilization. After that, he says, "the whole discussion changed overnight." Power consumption per rack started to dip. "The whole density thing gets less interesting when your costs are allocated based on power consumed," he says.

Once Microsoft began charging for power, its users' focus changed from getting the most processing power in the smallest possible space to getting the most performance per watt. That may or may not lead to higher-density choices — it depends on the overall energy efficiency of the proposed solutions. On the other hand, Belady says, "if you're charging for space, the motivation is 100% about density."

Today, vendors design for the highest density, and users are often willing to pay more for a higher-density server infrastructure to save on floor space charges, even when performance per watt is lower because of added power distribution and cooling needs. But on the back end, 80% of operating costs scale with electricity use — and the electromechanical infrastructure needed to deliver power and cool the equipment.

Belady, who previously worked on server designs as a distinguished engineer at HP, argues that IT equipment should be designed to work reliably at higher operating temperatures. Current equipment is designed to operate at a maximum temperature of 81 degrees. That's up from 2004, when the official specification, set by the ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Technical Committee 9.9, was 72 degrees.

> **We're beyond the point where more density is better. The minute you double compute density, you double the footprint in the back room.**
>
> **CHRISTIAN BELADY,** LEAD INFRASTRUCTURE ARCHITECT, MICROSOFT CORP. GLOBAL FOUNDATION SERVICES

But Belady says running data center gear even hotter than 81 degrees could result in enormous efficiency gains.

"Once you start going to higher temperatures, you open up new opportunities to use outside air and you can eliminate a lot of the chillers, but you can't go as dense," he says. Data centers in some parts of the country already turn off chillers in the winter and use economizers, which use outside air and air-to-air or air-to-water heat exchangers to provide "free cooling."

If IT equipment could operate at 95 degrees, most data centers in the U.S. could be cooled with air-side economizers almost year-round, Belady argues. And, he adds, "if I could operate at 120 degrees, I could run anywhere in the world with no air conditioning requirements. That would completely change the game." Unfortunately, there are a few roadblocks to getting there. (See story on page 30.)

Belady wants equipment to be tougher, but he also thinks servers are more resilient than most administrators realize. He believes that the industry needs to rethink the highly controlled environments that host distributed computing systems today.

The ideal strategy, Belady says, is to develop systems that optimize each rack for a specific power density and manage workloads to ensure that each cabinet hits that number all the time. In this way, both power and cooling resources would be used efficiently, with no waste from under- or overutilization. "If you don't utilize your infrastructure, that's actually a bigger problem from a sustainability standpoint than overutilization," he says.

What's Next

Belady sees a bifurcation coming in the market. High-performance computing will go to liquid cooling, while the rest of the enterprise data center — and Internet-based data centers like Microsoft's — will stay with air but move to locations where space and power costs are cheaper so they can scale out.

Paul Prince, chief technology officer of the enterprise product group at Dell Inc., doesn't think most data centers will hit the power-density wall anytime soon. The average power density per rack is still manageable with room air, and he says hot aisle/cold aisle designs and containment systems that create "superaggressive cooling zones" will help data centers keep up. Yes, densities will continue their gradual upward arc. But, he says, it will be incremental. "I don't see it falling off a cliff."

At ILM, Clark sees a move to liquid, in the form of closely coupled cooling, as inevitable. Clark admits that he and most of his peers are uncomfortable with the idea of bringing liquid into data centers. But he thinks that high-performance facilities will have to adapt. "We're going to get pushed out of our comfort zone," Clark says. "But we're going to get over that pretty quickly." ◆

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Quick STUDY

Flash Memory

Get up to speed on the storage technology inside memory cards, smartphones, USB sticks and the new solid-state drives. By Russell Kay

DEFINITION

Flash memory is a solid-state chip that maintains stored data without any external power source. It is commonly used in portable electronics and removable storage devices, and to replace computer hard drives.

FLASH MEMORY is inside your smartphone, GPS, MP3 player, digital camera, PC and the USB drive on your key chain. Solid-state drives (SSD) using flash memory are replacing hard drives in netbooks and PCs and even some server installations. Needing no batteries or other power to retain data, flash is convenient and relatively foolproof.

As with other solid-state technologies, flash memory's history includes rapidly increasing capacity, ever-smaller physical sizes and continually falling prices.

Flash memory is a type of electronically erasable programmable read-only memory (EEPROM), memory chips that retain information without requiring power. (This is different from flash RAM, which does need power to retain data.) Regular EEPROM erases content byte by byte; most flash memory erases data in whole blocks, making it suitable for use with applications where large amounts of data require frequent updates. Inside the flash chip, data is stored in cells protected by floating gates. Tunneling electrons change the gate's electronic charge in "a flash" (hence the name), clearing the cell of its contents so it can be rewritten.

Flash memory devices use two different logical technologies — NOR and NAND — to map data. NOR flash provides high-speed random access, reading and writing data in specific memory locations; it can retrieve as little as a single byte. NOR is used to store cell phones' operating systems; it's also used in computers for the BIOS program that runs at start-up.

NAND flash reads and writes sequentially at high speed, handling data in small blocks called pages. This flash is used in solid-state and USB flash drives, digital cameras, audio and video players, and TV set-top boxes. NAND flash reads faster than it writes, quickly transferring whole pages of data. Less expensive than NOR flash, NAND technology offers higher capacity for the same-size silicon.

As a NAND chip wears out, erase/program operations slow down considerably, causing more retries and bad block remapping. Moving many small files could further degrade transfer rates. Catastrophic failure happens only with extended use (after thousands of writes and accesses); periodic backup and replacement forestall this problem.

Flash Applications

USB drives: Introduced in 2002, USB drives encapsulate flash with a memory controller in a small package offering high capacity, fast transfer rates, flexibility and convenience; some feature built-in hardware encryption and password protection. Compared with floppy or optical drives, USB flash drives store more data and provide easy file transfer between most devices with a USB interface.

In December 2004, *Computerworld* described a 2GB flash drive that cost more than $400; nowadays, 2GB devices can commonly be found for under $10. This February, Kingston Technology Corp. announced U.S. availability of a 256GB flash drive — the biggest yet — for $1,100.

Memory cards: These have evolved from the matchbook-size CompactFlash cards introduced in 1994 through 2001's postage-stamp-size Secure Digital cards to the latest miniSD and microSD cards, with higher capacities and faster transfer speeds at every step.

Solid-state drives: The newest flash memory application, SSDs can replace a computer's hard drive. They have no moving parts, so mechanical failure is near zero. Solid-state drives are quieter and smaller than hard drives, and they provide faster response, access and boot-up times but consume much less power and run cooler. Traditional hard drives currently offer greater capacity and a lower price, but this will likely change. Early concerns that flash memory's finite number of erase/write cycles would be a problem are abating as warranties for flash-based SSDs approach those of hard drives. ◆

Kay *is a Computerworld contributing writer in Worcester, Mass. Contact him at russkay@charter.net.*

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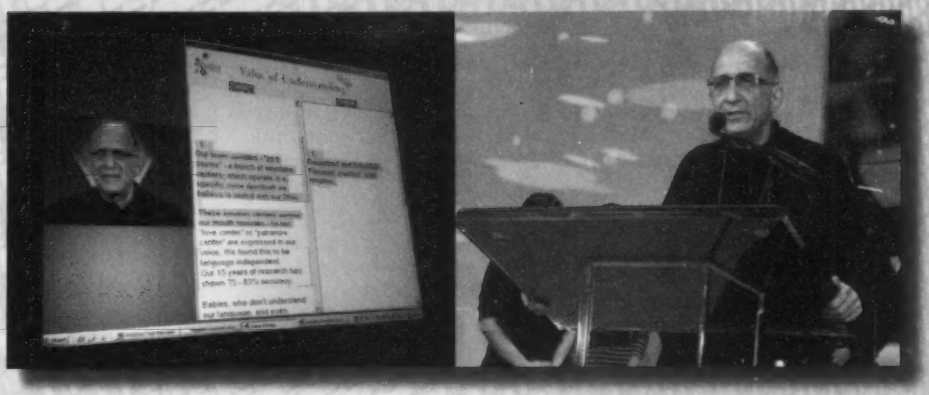

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Security Manager's Journal

MATHIAS THURMAN

It All Comes Down to Patching

You may have an extremely sophisticated security program in place, but it's all for naught without patch management.

DOES IT ALL COME DOWN to patch management? As a security manager, I pursue many initiatives, striving to protect the company on many fronts. But patch management is a key metric of our risk exposure, since there is a direct correlation between security incidents and patch compliance. So, in a way, it does all come down to something as basic as patch management, because if we fail there, we can't be secure.

Of course we have a patch management policy, but I've been frustrated in trying to get our various IT and engineering departments to comply with it.

I'm not even talking about the impossibility of patching the control PCs that are connected to tools running in our labs and our engineering departments. There, we need to maintain older versions of operating systems to support legacy products. We can't keep those patched, and I accept that.

Instead, I'm talking about things like the deployment of new virtual servers. When we first talked about implementing virtualization, it was agreed that we would keep on top of the security patches for the images used to deploy new virtual servers. At first that process was followed, but it's very easy to bypass the formal change-control process when deploying new servers, and as time went by, I started noticing that some virtual servers didn't have the latest patches.

A year ago, when the patch process was running smoothly (the honeymoon phase), I authorized the disabling of Windows Update so that we could use Microsoft System Center Configuration Manager to handle updates. It seemed like a reasonable response to a big problem: Some PCs didn't operate properly after the automatic downloads. Better to disable the automatic updates in favor of a testing and validation process. That way, we could push out patches only when we were sure that potential problems had been mitigated. That led to a new problem, though: It could take weeks, if not a month, to deploy patches that had to be tested and validated first; so much for timely patching. As you would expect, the delays led to an increase in security incidents.

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> **It can take weeks to deploy patches that have to be tested and validated first.**

Trouble Ticket

» At issue: Patching is the very basis of good security practice, but some frustrations with patch management remain.

» Action plan: Never let up, and continually find new ways to ensure compliance.

But we could institute some compensating controls. I told the IT department to identify the IP addresses or machine names of PCs that weren't patched properly and add them to watch lists for our intrusion-detection sensors to monitor. And because we don't have full IDS coverage, I also ordered the installation of a host-based intrusion-detection agent. I'm also talking to our network team about creating a separate quarantine virtual LAN with appropriate firewall rules to protect our main corporate environment from attacks targeting vulnerable servers.

Get the NAC

But even with these new policies in place, along with our Web content filtering, firewalls and network monitoring infrastructure, we still have a big problem: We have no control over the connection of unauthorized devices to our network. Anyone at all can connect any sort of device to our network — and then introduce malware or steal intellectual property.

My great hope is that we can implement network access control someday soon. NAC would enable us to guarantee the configuration of any device that attempted to connect to our network (preadmission NAC). It would also establish the identity of the user of that device and control which resources that device could access (postadmission NAC). NAC is on my road map, but unfortunately, there's no funding available at this time. For now, it is the Nirvana I aspire to. ◆

This week's journal is written by a real security manager, ***"Mathias Thurman,"*** *whose name and employer have been disguised for obvious reasons. Contact him at mathias_thurman@yahoo.com.*

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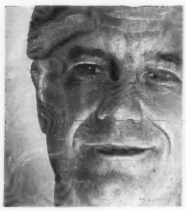

OPINION

BART PERKINS

Call Center Overuse Is a Hidden Price of Cost-Cutting

Think twice before you cut your product documentation and training budgets.

LET'S TALK ABOUT false economy — in particular, the false economy of cutting or eliminating product documentation and training budgets. When times are hard and budgets have to be slashed, the line items for documentation and training can look like fat, easy targets.

Yet cuts in those areas actually increase internal costs, and they can frustrate external customers in ways that are expensive for the company.

Internally, cutting off the source of information forces staff to learn new systems through trial and error, or by asking colleagues. This wastes everyone's time and causes unnecessary frustration.

Less obvious are the effects that result from your external customers' encounters with your documentation and training cuts. Your customers are accustomed to user-friendly products like the iPod, which is so intuitive that training and documentation are virtually unnecessary. Faced with a complex product that requires technical assistance, customers expect easy-to-locate educational videos on the Web, supported by additional product information. Take all that away, and frustrated customers are likely to call instead, looking to speak directly with someone at your company. Some are sure to look into competitors' products if they feel that you're not providing reasonable support.

A few thousand frustrated customers can have a big impact on your call center, leading to problems like these:

- **Higher call volumes.** Call centers are designed to handle large numbers of routine questions, not general product education. And calls for information that should exist elsewhere increase call center volumes to unpredictable levels.
- **Improper call handling.** Call center staffers are trained to respond to specific types of problems, following an established set of diagnostic questions to ensure that those problems are addressed properly and efficiently. Calls for which there are no prepared responses can fluster staffers, and callers may receive inaccurate information, be passed from person to person or, worst of all, never obtain the information they were seeking.
- **Inaccurate metrics.** Most call centers measure such things as wait time, talk time and call abandon rate. Those metrics will be distorted for a call center deluged with questions that staffers weren't trained to handle. The simple act of transferring a call in the hope of finding someone who can answer a question can greatly prolong the call. And if you know that your call center is getting hit with more information-seeking calls and yet call times haven't increased very much, it could be a sign that things are even worse: If call center compensation is directly linked to talk time, some staffers might be dropping difficult calls or inventing answers just to close calls quickly. That's likely to turn frustrated customers into angry ones.
- **Inefficient use of costly resources.** Whereas good documentation and training deliver consistent information for a finite cost, call centers are one of the least efficient ways to help people learn to use a product. What's more, accuracy of information is dependent on the knowledge level of the particular person answering the call. And inaccurate information may result in repeat calls.
- **Unhappy customers.** Customer frustration often results in customer loss. Enough said.

In the end, budget cuts for documentation and training merely shift costs to another department. Managers have been trained to calculate TCO for IT products. They need to similarly calculate the TCS — total cost of support — for their own products. ◆

Bart Perkins is managing partner at Louisville, Ky.-based Leverage Partners Inc., which helps organizations invest well in IT. Contact him at BartPerkins@LeveragePartners.com.

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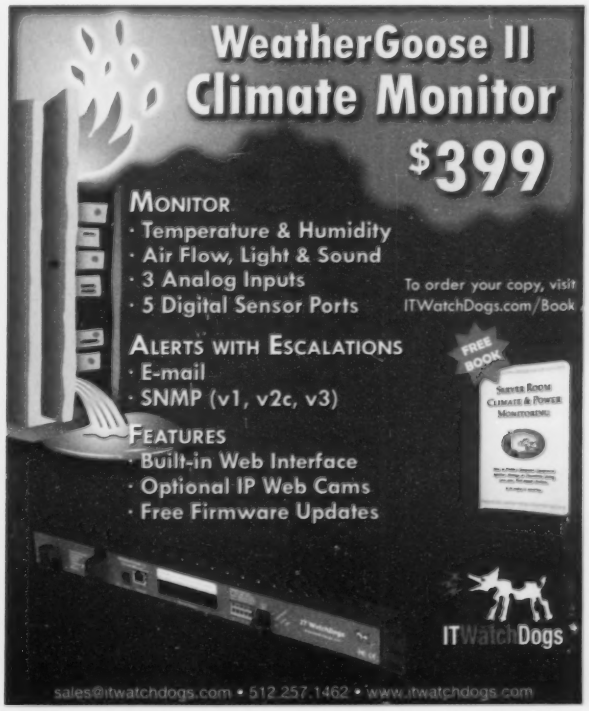


Career Watch

Q&A

David Foote

Foote Partners LLC

The CEO of IT workforce analyst firm explains why high volatility in the IT labor and skills markets will remain long after the economy recovers.

First of all, how are you defining and measuring volatility? Pay and demand for IT skills at more than 2,000 employers in North America that participate in our research. We've built several statistical gauges for examining trends in each. The IT Skills and Certifications Pay Index surveys pay premiums earned by 23,000 IT professionals for 438 individual technical and business skills, both certified and noncertified. Our IT Skills Volatility Index tells us what percentage of these skills are changing in market value, either up or down. We also survey salaries for nearly 100,000 IT workers and a few hundred job titles. All of these are updated continuously, but we tend to analyze labor market trends in three-month increments and have been doing so since 1998. We also stay in regular contact with several hundred IT executives, who provide us with deep-dive perspective that the data itself cannot.

What have you been finding? Quarter-by-quarter skills volatility has been in the 29% to 39% range in the past year and a half. From 2005 to 2008, it averaged only half of that. This index has been swinging back and forth by as much as 10 points over periods as short as three months, which is unprecedented. As for the market values themselves, noncertified skills have shown overall gains in two straight quarters, while average certification pay has been on a steady decline for four years straight. But as you dig deeper into each skill category, consistency is very hard to find. The truth is that IT employment and salaries have been stabilizing, but pay and demand for specific skills and specialized talent remain highly volatile and unpredictable. There are clearly other factors than the recession at work here.

Like what, for instance? An almost seismic shifting to new IT service delivery and sourcing models, for one thing. CIOs have been struggling with this for years, under pressure from their business counterparts to become more agile and flexible, react faster and execute more quickly – to rise to the challenge of becoming a business impact player. But there's risk involved in organizational and staffing change of this magnitude, and it's not easy. In better times, the general attitude for many was, "Why stick my neck out?" So instead, they'd just sort of rearrange the furniture. What the downturn has done is get IT managers "unstuck" and motivated. For some, it is career opportunism. For the rest, it's survival: fear of losing their jobs if they don't take advantage of a rare window of opportunity to start blasting away at traditional IT staffing models.

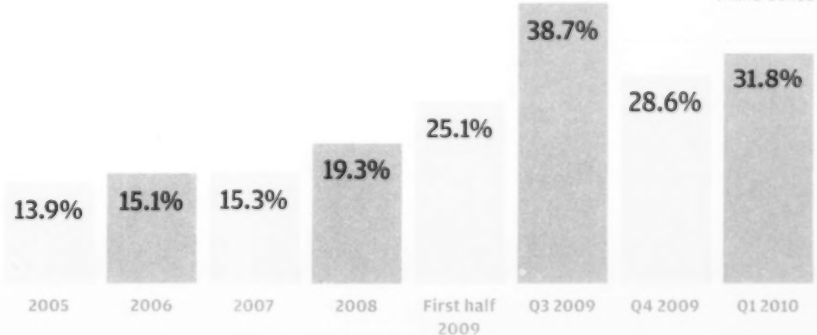
What are these new models? Think skills acquisition, not jobs acquisition. Managed services, cloud computing, SaaS, PaaS, IaaS. Contractors and consultants, not full-time hires. Adaptive, iterative execution, not bloated, stagnating project portfolios. High-performance teaming, not reliance on the same exhausted IT superstar performers to get the job done time and again. Being great at operational stuff but having more impact in product development, ideas, innovation and strategic areas that will help businesses survive and thrive in a brutally competitive, fast-moving global marketplace. There is progress being made out there right now by some courageous but very nervous IT executives trying to engineer this transition. It's causing higher volatility in pay and demand for skills and people as the natural condition of a transforming workforce. This is the new standard in market behavior for years – not months – to come.

There's no turning back? We will never return to the sort of labor marketplace for IT professionals that existed before 2008. But that's a good thing. Business leaders know that it's not technology per se but the ability to use it wisely that counts. They desperately need to get to the other side of this IT transformation as quickly as possible and get more of these business-technology hybrids into the game.

– JAMIE ECKLE

IT Skills Volatility Index

Companies were asked what percentage of IT skills and certifications had changed in market value from the preceding period.



SOURCE: FOOTE PARTNERS LLC, IT SKILLS AND CERTIFICATIONS PAY INDEX, 2005 TO 2010 QUARTERLY EDITIONS

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Business Development Managers/Directors: Manage sales activities and achieve sales quota for assigned territory. Help Syntel's sales leadership in planning and rolling out an inside sales strategy. Must have a Bachelor's degree and 3+ years of experience.

All positions are located throughout the U.S. and travel is usually required.

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SHARKTANK

TRUE TALES OF IT LIFE AS TOLD TO SHARKY

HAL MAYFORTH

Epic Fail-over

The IT director at this big insurance company makes a big deal about how much money can be saved by consolidating virtual machines. But this consultant pilot fish isn't so certain it's a good idea. "Many of us said, 'Are you sure about fail-over?' " says fish. "We finally got all the work done, migrating applications and databases. We got a thank you. Director got promoted – he saved the company $10,000 per month. Six weeks after this project was completed, the company's Web sites – *all* customer-facing and team-facing access – crashed. After some research, it was discovered that the hosting company, under the director's signature, had put *all* of the servers, primary and fail-over, in the same hardware frame, which had a power supply failure. The company was offline for nearly 30 hours. But the director kept his promotion."

Four-Letter Words

At this semiconductor fabrication facility, they're running out of four-digit numbers. "The first step of the manufacturing process was to microscopically etch four-digit serial numbers onto the silicon using a laser," explains an IT pilot fish there. "One day, a microcode change request for the laser machine was made by manufacturing. They wanted the laser reprogrammed to use alphanumeric characters." Fish's first thought: Many offensive words might be constructed from four alphabetical characters. Do you want us to make sure those are filtered out? he asks. Response: Don't bother. Reports fish, "From time to time afterward, we would look up and speculate: 'I wonder if they're shipping JUNK in the factory this week.' "

Déjà Vu All Over Again

Pilot fish goes in for a job interview, and the hiring manager tells him, "I like to give everyone a little programming test. You should be able to complete it within 15 minutes." Sure, says fish, and it takes him only five minutes to produce a two-line solution with a Boolean return value. Interviewer looks at fish's solution and says, "This is correct. I would only point out that you could make it even simpler by putting the expression right into the Return statement." Fish doesn't get the job. A year later, fish is once again headed for a job interview. Something about the building seems oddly familiar. But it's not until he meets the interviewer that he realizes why: This is the same job he interviewed for more than a year earlier. It's the same programming test, too. "This time, I pounded out the one-line solution in 15 seconds flat," says fish. "The interviewer looked at my solution and said, 'This is the correct solution – and that's the fastest I've ever seen anybody do it!' And I still didn't get the job."

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SCOT FINNIE

An Early Year-End Ritual

This year, our predictions and analysis won't get lost in the holiday cheer.

THE SMARTEST PEOPLE in the tech industry spend a lot of their time reading tea leaves. Generally, the computer press doesn't take part in this exercise, but each New Year's, virtually every pundit with a keyboard dashes off a tech prediction piece. To change that up a little, this spring I asked *Computerworld* reporters and editors for their predictions of the most important trends of the next year or so. Here are some of their thoughts:

1. Green IT. Managing IT for power savings was an overhyped notion that all but died during the recession. With the economic recovery, look for it to resurge with far less PR fanfare, progressing slowly and always with an eye toward business ROI. Green IT makes sense, but only if you're already investing in infrastructure changes that will make managing energy a computer-controlled endeavor.

2. Cloud, cloud, cloud. Talk about hype! But software as a service, platform as a service and infrastructure as a service are all moving along. It's still early days, but we're betting that cloud isn't going to burn off and fade away. Expect slow adoption, with those leading the way celebrated as pioneers. And virtualization and internal cloud-based shared-services infrastructures seem more inevitable when you think of them as just the next step on the path toward true server consolidation.

3. Mobile devices. The smartphones and other gadgets that have permeated your organization are only the tip of the iceberg. It doesn't matter if the iPad is a business device or not. It's a people device, and people will use it at work. Most IT shops are unprepared for the onslaught of this coming user-led revolution. Get ready, or get run over.

4. Unified communications. Unified communications is where mobile was 10 years ago. It promises to enhance productivity, but much still needs to be hammered out. This won't be its year.

5. Business Intelligence. BI and analytics hit their stride this year. That's because the recession may have been the perfect time for companies to employ business intelligence best practices and analytics tools to assess what works and what doesn't.

6. Data de-duplication. This is an idea whose adoption is assured because of its simplicity. Eliminating redundant data can cut storage needs by 70% to 90%, and that reduces the overall cost of ownership and extends the life of storage hardware. Data tiering and cloud storage are also promising.

7. Enterprise 2.0. Many companies are just tumbling to the fact that there are advantages to be gained by giving employees easy access to the expertise and experience available throughout the organization. This idea, encapsulated in the term "Enterprise 2.0," has many business software vendors inserting bits of Web 2.0 functionality into their products to facilitate information-sharing. But Enterprise 2.0 will be a business transformation more than anything else, and IT can help lead that transformation.

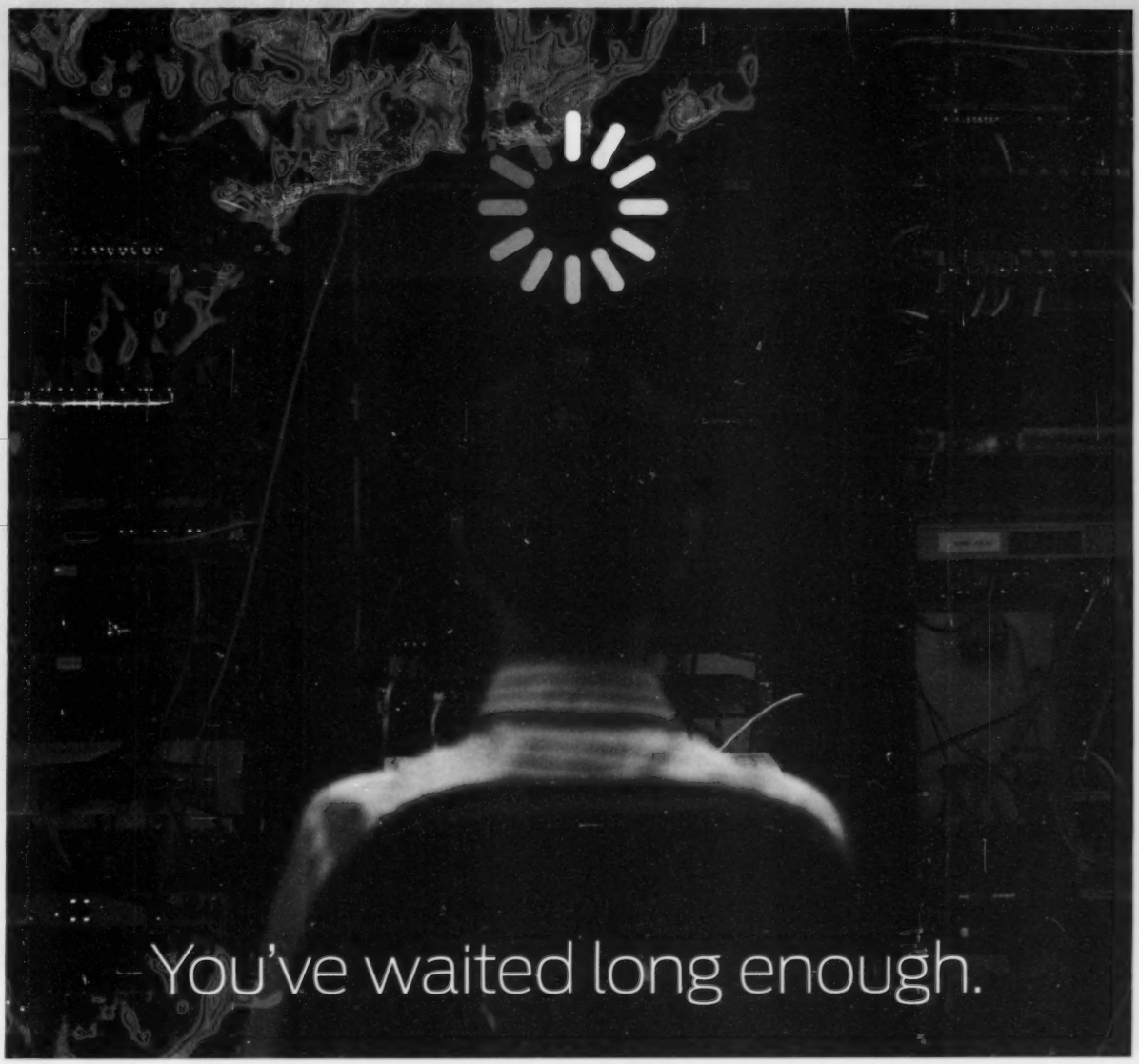
8. Videoconferencing. It may not be business's first choice for making contact, but the recession propelled it into the limelight as travel budgets were cut. Now it's mainstream. If your company isn't using videoconferencing, it might be soon.

9. Identity management. Need I say more? This seemingly perpetual IT headache should be resolved at your company this year.

10. Security. It's just a matter of time before the world suffers the next-order security threat. How would such an event galvanize IT shops? If a cyberattack against the U.S. results in a massive loss of data or public services, Congress could mandate compliance with new regulations overnight.

In a few months, we'll bring you additional predictions and more-thorough analysis at a time of year when they won't get lost in the holiday cheer. We're moving *Computerworld*'s well-researched and highly valued Forecast edition from January to September. We hope that publishing it in the fall will enable you to make better use of it in your annual budgeting. ◆

Scot Finnie is *Computerworld*'s editor in chief. You can contact him at sfinnie@computerworld.com.



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